CQ

OCTOBER, 1947

The Radio Amateurs' Journal

35¢

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With the New

DB22A PRESELECTOR

Because of its advanced preselector design and use of 6BA6 miniature tubes, the new DB22A Preselector has an average overall gain of 30 DB, throughout the tuning range of .54 to 44 MC. Image ratio, too, is phenomenal—better than 50 DB with a communications receiver having a single stage of RF. The DB22A also provides tremendous increase in both gain and selectivity when used with a good communications receiver.

The DB22A is entirely self contained, entirely in a class by itself. Connect it to your receiver just like a good antenna — no extra wiring — no plug-in coils are required.

AVAILABLE IN TWO SIZES

The DB22A is available in two size cabinets: one to match the height of the RME 45, designated as "Standard" and the other to match the RME 84, designated as type "S".

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The new RME 84 is a precision instrument — no low priced, "average" components are used anywhere in its construction. Tuning range covers frequencies from .55 to 44 Mc. A planetary drive mechanism, spring loaded to eliminate backlash, makes operating a pleasure. Portability, too, is built into the RME 84. Provision is made for connection to 110 AC, batteries or RME VP-2 vibrapack. Other features include high sensitivity, new series noise limiter and provision for "S" meter.

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RME

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Peoria 6, Illinois U. S. A.

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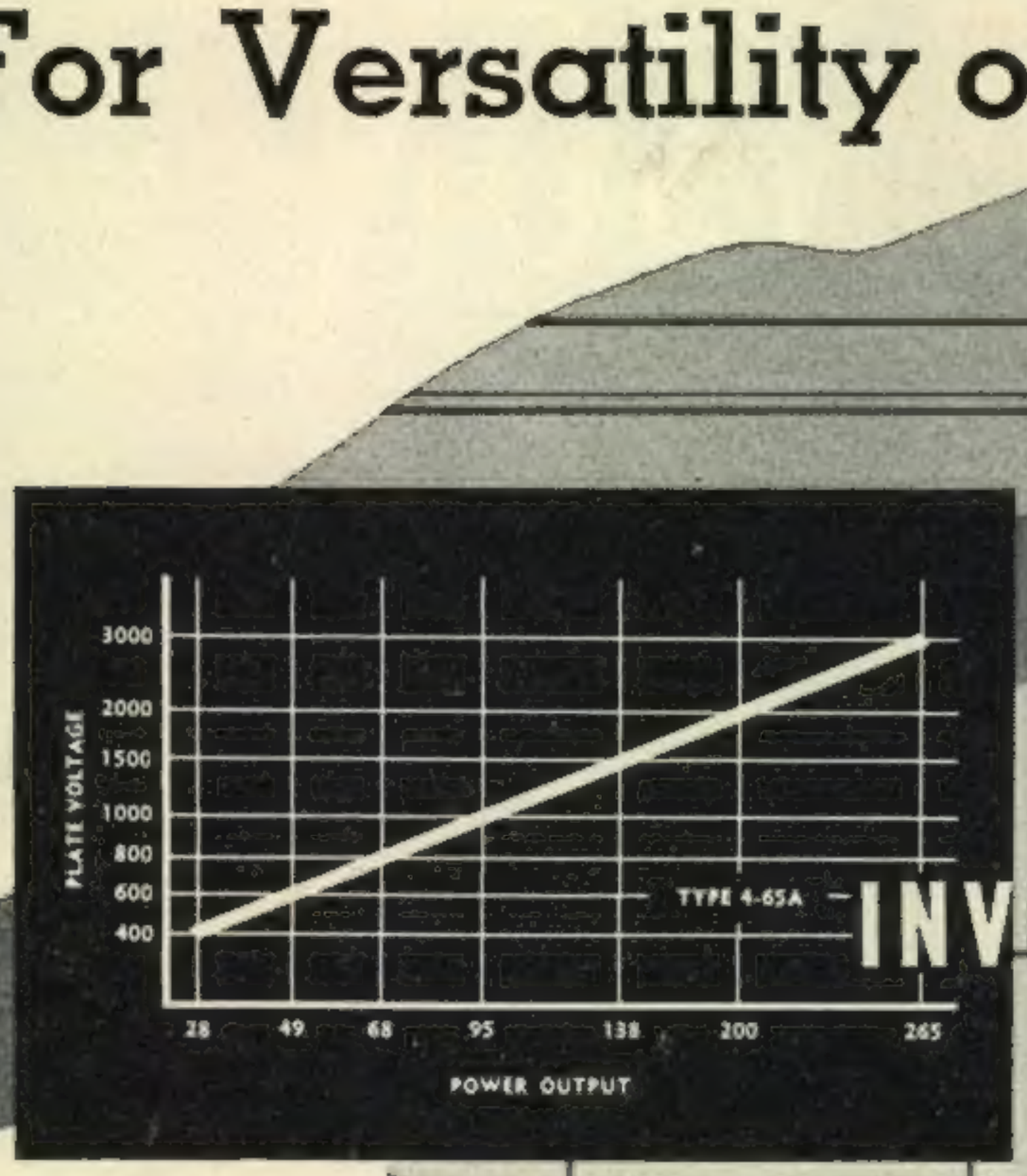
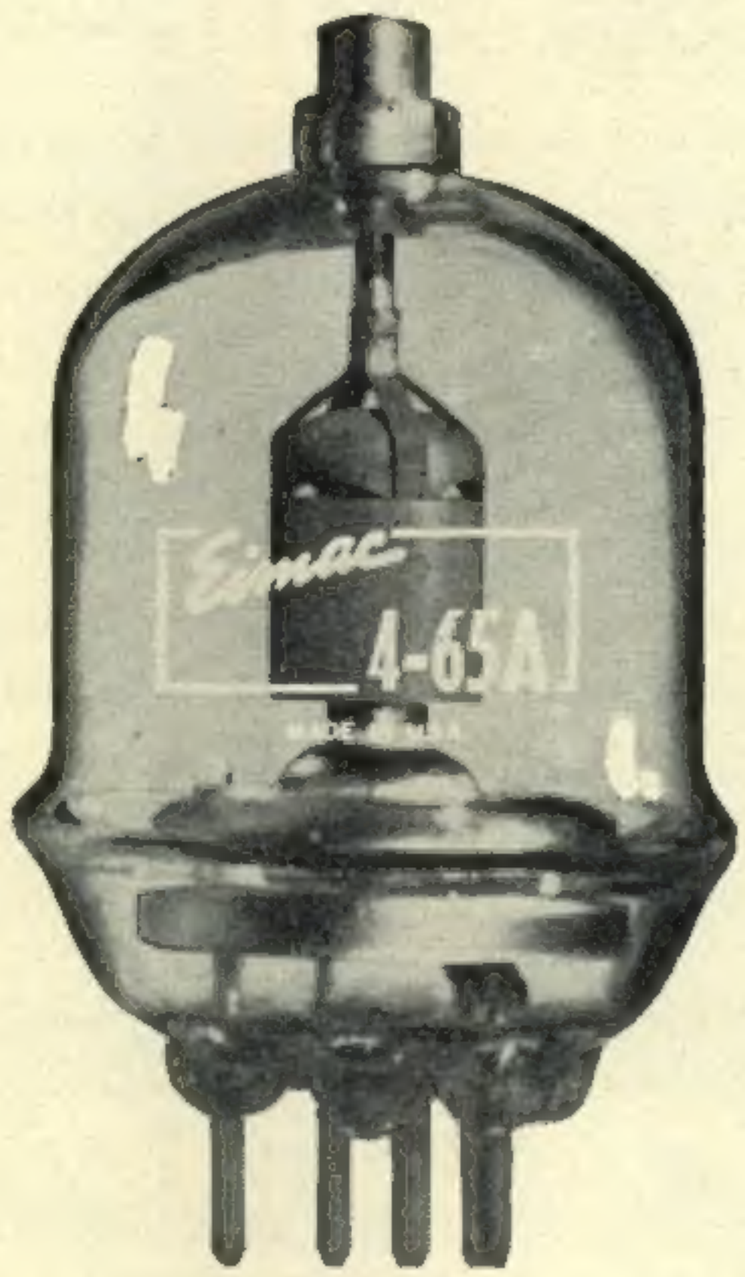


WITHIN THIS POWER RANGE

INVESTIGATE THE NEW

EIMAC 4-65A

MORE FOR YOUR VACUUM TUBE DOLLAR



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Vol. 3 **OCTOBER, 1947** **No. 10**

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A portion of the operating position at the American Legion National Convention amateur station, K2AL. Shown in the picture, from left to right: H. T. Hayden, W2FO; Violet Villar, W2NQC; checking the rig in the corner, D. L. Lindsay, W2PL; looking over traffic, J. J. Vitale, W2IIN. The remaining two operators are not identified. W2BW, W2FO, W2PL, W2IIN, W2LSD, and W2SNN were primarily responsible for the organization and operation of K2AL. Abbott, Hammarlund, National, and Temco supplied the equipment, set up on the 17th floor of N. Y.'s Hotel Pennsylvania during the convention.

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Model SX-43

"The hottest ham performance ever at this price . . ." That's the verdict of amateurs who have had a chance to try Hallicrafters new Model SX-43.

This new member of the Hallicrafters line offers continuous coverage from 540 kilocycles to 55 megacycles and has an additional band from 88 to 108 megacycles. AM reception is provided on all bands, except band 6, CW on the four lower bands and FM on frequencies above 44 megacycles. In the band of 44 to 55 Mc., wide band FM or narrow band AM just right for narrow band FM reception is provided.

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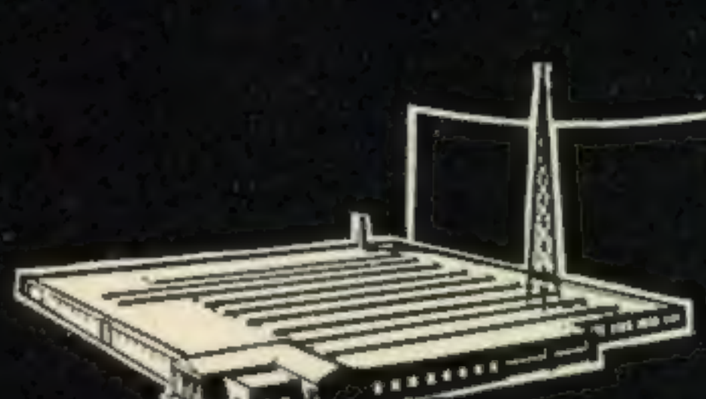
- SEPARATE ELECTRICAL BANDSPREAD CALIBRATED FOR THE AMATEUR 3.5, 7, 14, AND 28 Mc BANDS



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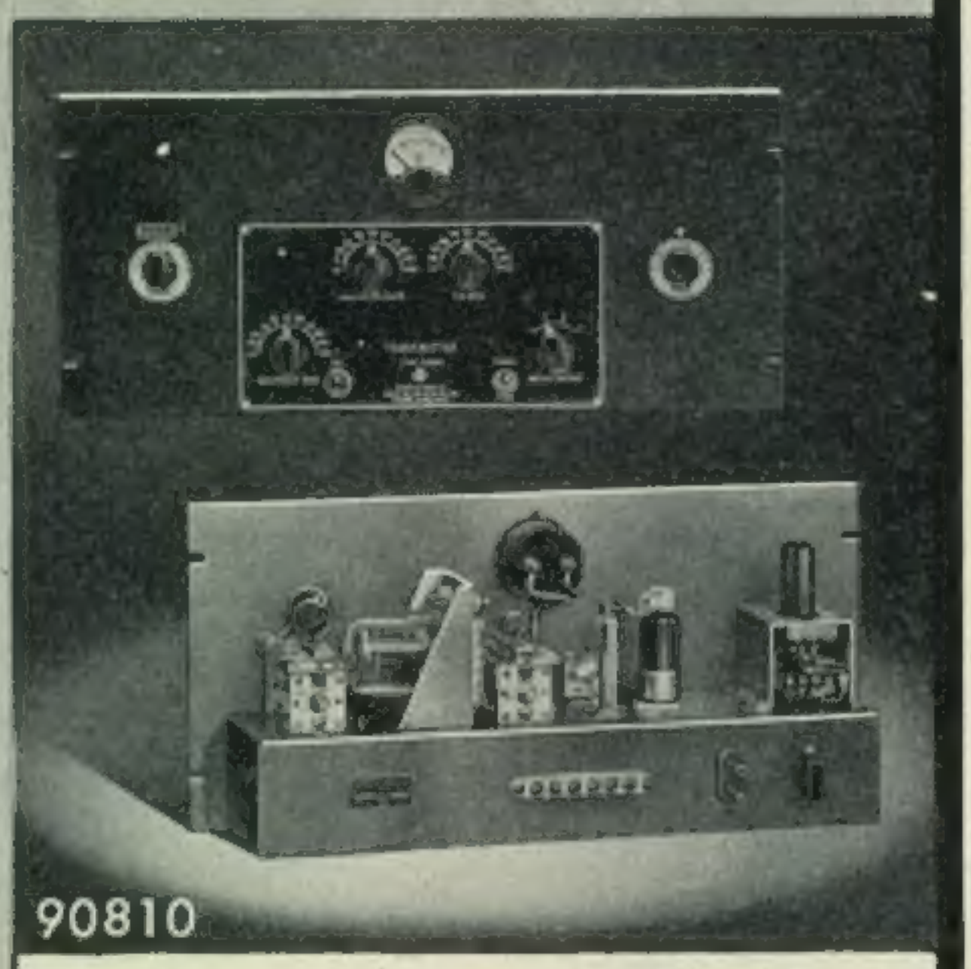

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The No. 90810 crystal control transmitter provides 75 watt outout (higher output may be obtained by the use of forced cooling) on the 10–11, 6 and 2 meter amateur bands. Provisions are made for quick band shift by means of the new 48000 series high frequency plug-in coils.

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• • • Letters • • •

The Name "Ham"

509½ Yonge St., Toronto, Ont.

Editor, *CQ:*

A letter from W6BAA published in May *CQ* points out that a more dignified name than "ham" should be attached to amateur radio operators.

I am a free lance writer-photographer and from time to time I do amateur radio stories for popular magazines and newspapers. I make it a point to never use the word "ham." Outsiders think we are slightly cracked when we label ourselves hams and they find the term amusing. I find the name "amateur radio operator" satisfactory enough, and it seems to me that if this were constantly used it would be unnecessary to find any other substitute.

Amateurs have only themselves to blame for much of the poorly phrased amateur radio publicity that finds its way into the popular press. On the air and in normal speech they consistently use expressions and phraseology which, to put it mildly, makes us look like a bunch of idiots.

When you are dealing with newspaper reporters, magazine writers and other members of the writing fraternity, ask them not to use the term "ham" and if at all possible make sure that other silly sounding terms don't creep into their stories. Magazine writers will be very cooperative. It is newspapermen who will be least concerned with your feelings because they have to work fast and they are used to sticking to conventional and well-known terms as much as possible. Club publicity directors might well lead an effort to have amateur matters treated properly in popular publications.

Eric Adams, VE3ALG

227 S. Quincy St., Green Bay, Wis.

Editor, *CQ:*

Reading your May issue I found a very interesting letter from W6BAA. In answer to his letter I will quote the following section from the book "Calling CQ," by Clinton B. DeSoto, W2IU, ex-W1CBD-W9KL, published by Doubleday Doran & Co.:

"'Ham' radio? That term itself deserves explanation. Its origin probably goes back to the nineteenth century English sports writers whose slang term for 'amateur' was 'am', pronounced 'ham' by the cockneys. It came to amateur radio from the landlines where it was originally applied to 'cubs' or neophytes; now its meaning is that of 'unprofessionalism'. In origin and significance the term in radio is quite different from that of the theater where it is used to denote an actor of indifferent ability. Amateurs view their appellation with considerable pride. To be considered a 'good ham' is just about the highest mark of honor there is."

So remember this, Mr. Kanaga.

Antonio Cruz Uribe, W9ST/XE1BT

Is Code Absolutely Essential?

2013 Sherwood Road, Kingsport, Tennessee

Editor, *CQ:*

I have read with passive interest your recent letters dealing with the pros and cons of a code requirement. At least, the arguments purport to have a con side.

Since I am against a code requirement I would like to add my two cents' worth to the con side. There is no more reason for requiring code (which is, in essence, a foreign language) than there is a

ADDRESS UNKNOWN

A man without an address is like a man without a country. Even his best friends never know where to find him! He misses all the beautiful, worthwhile things in life. Your radio "address" is the frequency on which you operate. Although you may share it with others your "spot" in the band becomes a treasured and personal thing . . . the key to your amateur enjoyment. PR Precision CRYSTALS give you the finest, most stable, frequency control the art has developed. With a PR CRYSTAL in your rig you KNOW where you are . . . you know you will STAY THERE! Every PR is UNCONDITIONALLY GUARANTEED. Order from your jobber.—Petersen Radio Co., Inc., 2800 W. Broadway, Council Bluffs, Ia. (Telephone 2760)

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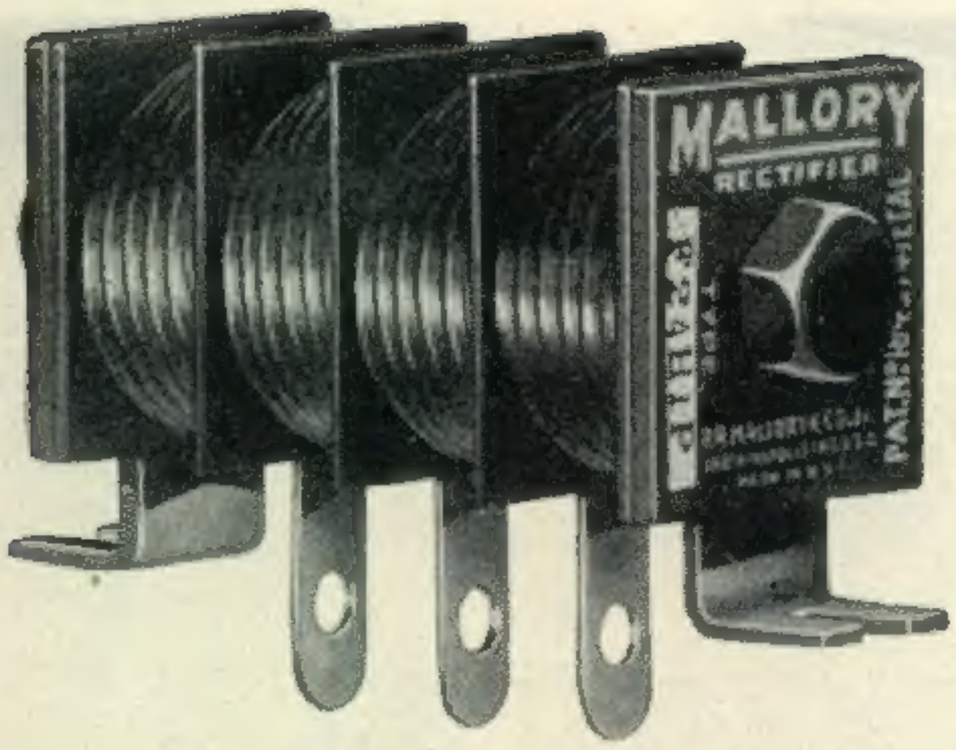

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For stock types of Mallory Rectifiers, Battery Chargers and Power Supplies, refer to the Mallory Approved Precision Products Catalog.

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reason for requiring a knowledge of Russian. Or any other language as far as that goes.

To argue that code will get through when voice will not is picayune. A million watts of voice will get through when a hundred of code will not but that is no sane argument for everyone being allowed a megawatt of voice.

To argue that it screens those who have a so-called "ham-spirit" from those who do not is baseless; as baseless, for example, as replacing it with a test involving a complete theoretical knowledge of directional antenna arrays..

A code speed qualification certainly has its place in, say, a specific band of frequencies reserved for code alone but certainly not as an over-all requirement for all ham bands. One might just as well require a vocabulary of 5000 words before granting a voice license by using exactly the same logic.

I would certainly be interested in hearing from those who advocate a code requirement—specifically those who can support their cause with more than emotional reasons.

Richard G. Devaney

Attention Traffic Men!

P.O. Box 6725, Baltimore 4, Md.

Editor, *CQ:*

I heartily endorse the suggestion by W1EFW in the July issue of *CQ*. A general discussion of the operating problems of the traffic man and the publication of information whereby operating schedules could more satisfactorily be coordinated, would be of great value.

In accordance with W1EFW's idea, I would be happy to contribute material as Manager of the Traffic Outlet, Manager of the MD-DEL-DC Section Net, Member of Trunk Line C and an occasional participant in NYC/LI, West Virginia Net and Trunk Line AP.

Albert E. Hayes, Jr., W3LVY

927 East 23rd St., Erie, Pa.

Editor, *CQ:*

W1EFW's letter appearing in July *CQ*, suggesting a traffic men's column, sounds good to me, and I think it would prove popular. Believe that traffic men should make more use of the 40-meter band, especially during the summer months. Before the war there was quite a bit of traffic activity on the high end of this band. W2LSD had quite an active traffic organization there known as the "Forty-meter Traffic System."

Ray Rosenberg, W3NCJ

1605 Palm Dr., Corpus Christi, Tex.

Editor, *CQ*.

The letter by W1EFW in July *CQ* concerning a column for traffic handling has met with high approval and enthusiasm. The idea has struck me before as it has probably struck many, but like others, I've neglected doing anything about it. I would like very much to see such a column in *CQ*, and let it contain useful information for the traffic handler and plenty of dope on trunk lines, etc. Although traffic is always a little slack during the summer months, winter will be here soon and traffic will again begin to pile up. So, if you can find room in *CQ* for such a column, it would be greatly appreciated here.

C. Wayne Wade, W5MKL

Sufficient interest in a traffic men's column has not yet been evidenced to go ahead with the idea. We are most anxious to hear from other readers in connection with the idea.—Ed.

Now...a 7-inch oscilloscope

IN THE LOW-PRICE RANGE!

The new Sylvania 7-inch Oscilloscope Type 132 is an AC operated general-purpose cathode ray unit for waveform study and voltage and current measurements. Large 7-inch Sylvania tube and new push-pull amplifier circuit provide "jumbo" patterns with maximum trace sharpness.

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Type 132 is designed and built to provide the finest instrument in its class. The panel is "efficiency designed" with control size and placement offering time-saving ease of operation.

And **. . . it's priced within the range of the average budget!**

Product of Sylvania's Electronics Division, sold through the Radio Tube Division, the 7-inch Oscilloscope Type 132 is available through your Sylvania Distributor. Mail coupon for full technical details.

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The DX "Champ" on 10 and 20 Meters

- *Unlimited rotation either direction*
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- *Deluxe rotator*
- *Positive position lock*
- *High forward directivity*
- *High front to back ratio*
- *Rigid low-loss elements*
- *Easily tuned*
- *Durable and efficient*
- *Non-resonant transmission line*

EXTREMELY effective for reception as well as transmission, the Deluxe Dual-Three 10-20 Signal Squirter Antenna is the first rotary beam offering full performance on both 10 and 20 meters.

Each of the two three-element arrays is coupled to the line with a separate Inductostub inductive coupling. This feature provides for unlimited rotation in either direction without mechanical connections. Match between antenna and line is so simplified that the Signal Squirter can be assembled, installed and operated without tedious, complicated adjustments.

Field strength tests show the three-element array has better than 30 db attenuation over more than 180° to the rear, and approximately 40 db front to back ratio.

The strong, but light, Deluxe Rotator is made of quality materials. Weighing only 56 pounds, and having a base and top diameter of only 15 inches, the rotator delivers ample torque thru precision reducing gears. These are actuated by non-interfering motors. Mechanism is completely enclosed and weatherproof. A solenoid brake locks rotator in position.

The selsyn indicator is synchronized with the array and always indicates the direction of the beam.

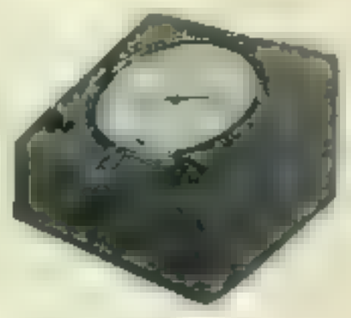
Center section and cross arms are light in weight, yet strong. Braced "T"-beam cross arms withstand high winds; three coats of the best synthetic enamel dependably protect them against weather.

Signal Squirter Kit includes Rotator with mounted Inductostub assembly, direction indicator, center section, elements and insulators with all hardware ready for installation.

Detailed assembly and erection instructions included with each kit. See your Jobber, or write today for complete details on the Signal Squirter.

Manufactured under patent number 2,292,791

Deluxe Rotator



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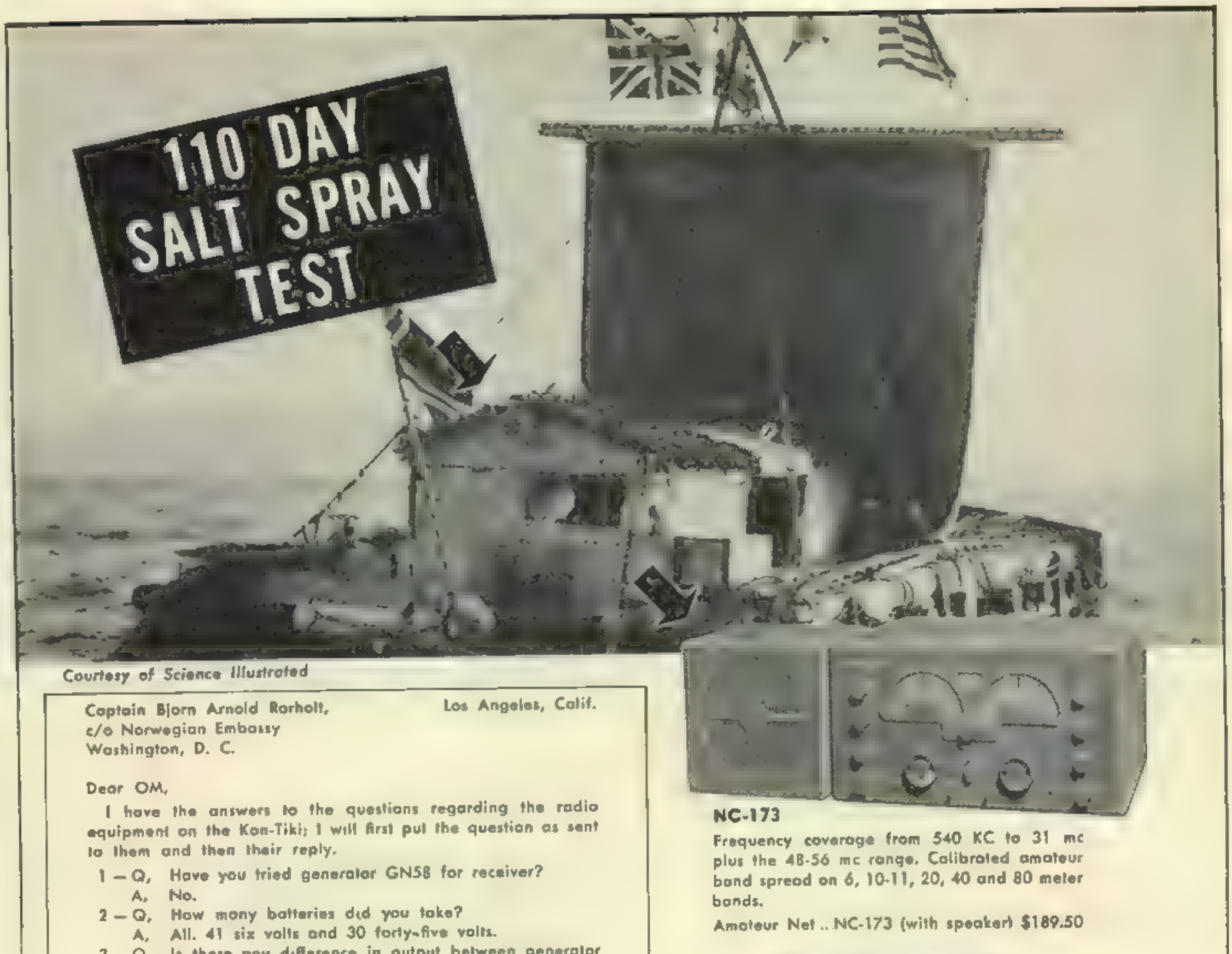

Courtesy of Science Illustrated

Captain Bjorn Arnold Rorholt,
c/o Norwegian Embassy
Washington, D. C.

Los Angeles, Calif.

Dear OM,

I have the answers to the questions regarding the radio equipment on the Kon-Tiki; I will first put the question as sent to them and then their reply.

1 — Q, Have you tried generator GN58 for receiver?
A, No.
2 — Q, How many batteries did you take?
A, All. 41 six volts and 30 forty-five volts.
3 — Q, Is there any difference in output between generator and battery operation?
A, Not tried yet.
4 — Q, Are you using 6995 KC crystal from the ten meter rig?
A, Yes, but ten meter rig in use too.
5 — Q, Have you removed last audio valve in 173 Receiver?
A, Tried, but receiver then too weak.
6 — Q, What kind of antenna do you normally use?
A, L antenna
7 — Q, Have you tried balloon or kite supported antennas?
A, Both tried.
8 — Q, Have you tried voice modulation since shortly after leaving Peru?
A, Yes, results not good.
9 — Q, Do you use mark two transmitter?
A, Yes, and then very good.
10 — Q, How does the NC-173 stand up under conditions on board?
A, Excellent.
11 — Q, How many hours can you operate the transmitter on one set of batteries?
A, High tension batteries very long life but long articles kill our heater batteries.

In case you did not hear me yesterday their heater batteries are used but Raaby tells me that they make 1½ volt units from their 45 volt batteries and then use four of these for six volts and thus get about four days service from each set. They have about five sets left so are O.K. for sometime yet.

"Pen" sends his vy 73 to you as do I and I hope to work you again soon. I am anxious to meet the boys but I am also going to miss these daily contacts with the raft.

I hope Knut, and Torstein keep up their radio and get on the air when they get back to Norway for I would enjoy very much keeping up our friendship via amateur radio.

Again VY73 to you Pronto and hope to cul.

Very Sincerely,

HAL —W6EVM

NC-173

Frequency coverage from 540 KC to 31 mc plus the 48-56 mc range. Calibrated amateur band spread on 6, 10-11, 20, 40 and 80 meter bands.

Amateur Net .. NC-173 (with speaker) $189.50

National NC EST 1914

The press of the entire country has carried stories concerning the day-to-day activities of the 6 young Norwegian scientists, members of the Kon-Tiki Expedition, who set out on a raft to drift more than 5000 miles across the Pacific Ocean.

Very little mention has been made, however, of the battery-powered transmitter and model NC-173 receiver which allowed the Expedition to dispatch over 500 messages and 30,000 words.

These figures furnish one more proof that a National receiver in the hands of a good operator makes an unbeatable combination.

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U.S.A.

MAKERS OF LIFETIME RADIO EQUIPMENT

A MESSAGE from the President

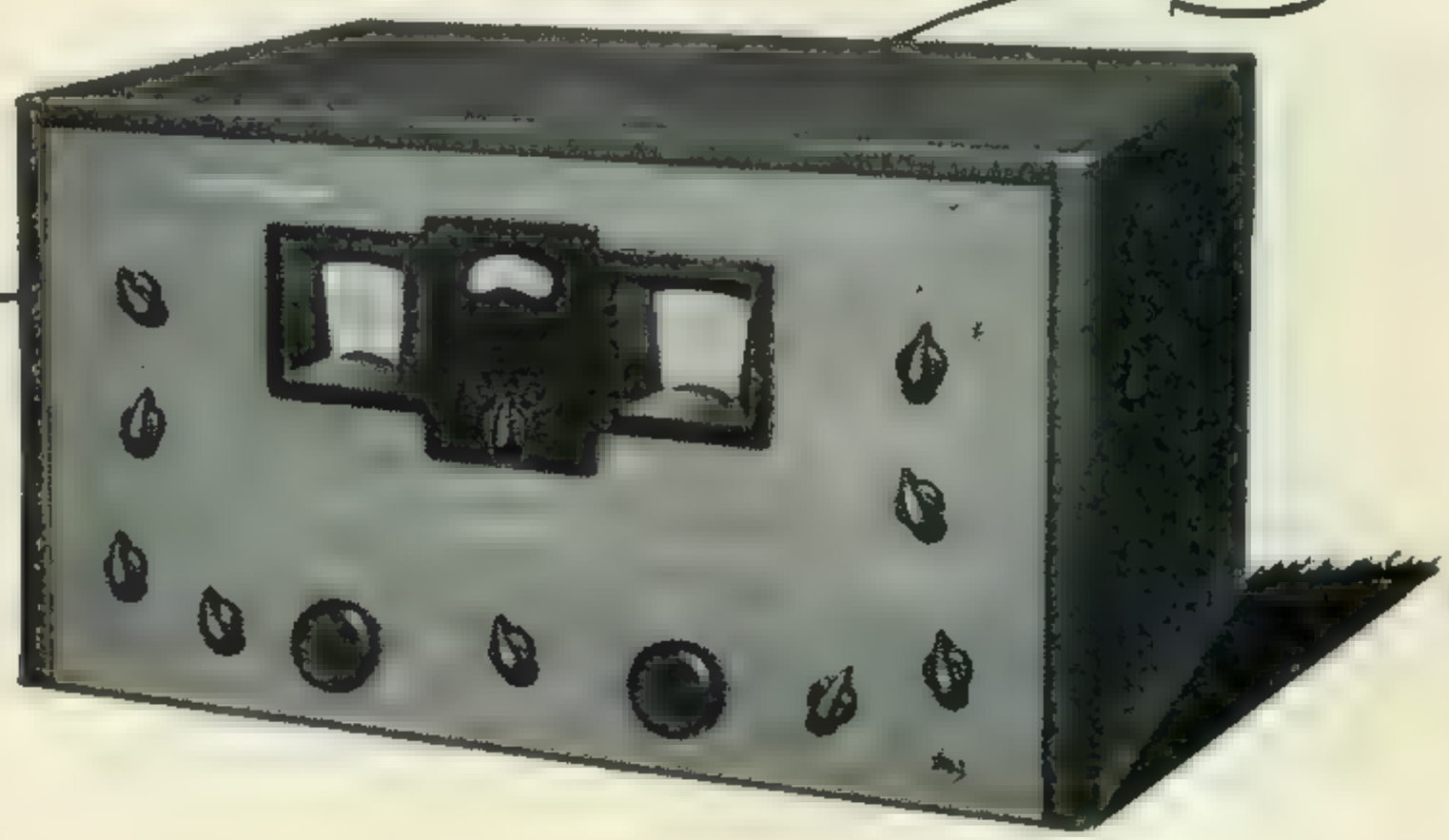
IN response to hundreds of inquiries, we wish to announce that there will be no new HAMMARLUND receiver in the price range of the HQ-129-X until the summer of 1948 at the very earliest.

Extra engineering effort, extra precision and extra care in manufacturing have made the HQ-129-X famous as the Ham's receiver that is built to professional standards.

You can buy the HQ-129-X with confidence. It has every up-to-the-minute improvement that radio science has so far developed for amateur radio receivers.

L. A. HAMMARLUND, *President*

HQ·129·X



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MANUFACTURERS OF PRECISION COMMUNICATIONS EQUIPMENT

ZERO BIAS

EDITORIAL

The Telecommunications Conference

WE HAD RESOLVED not to discuss the frequency conference this month because we still have nothing definite on all the frequency assignments. However, we have had so many calls, and there seems to be so much misinformation still circulating, that we would like to go over the situation as it now appears. We want it understood only part of this is official, and we are concerned principally with U. S. allocations.

Allocations from 31.7 to 10,500 mc have been reported out and it is assumed that they will be adopted as recommended. Gratifying news is that the American allocation is identical with that now in effect. Foreign amateurs suffered appreciable losses, based unfortunately upon the fairly valid argument of non-occupancy. High-frequency men will be glad to learn that there is a better than fifty-fifty chance that European hams may be permitted the use of 50 mc in certain countries. Chances for international work on 2 if they did exist are becoming pretty dim with a large cut in the 144-mc assignment outside of the U.S. We wish we were as confident on the outcome of the table of allocations from 3 to 25 mc.

How do our low-frequency bands stand? Again we would like to emphasize that these figures are not official, but are based on reasonably good sources of information. 80 meters will probably remain substantially the same in the United States, but elsewhere the amateurs are going to get severe cuts. This checks pretty much with the information we had last month. Just how much the foreign cuts are can be estimated by an informed guess that they will probably have not much more than 75 or 100 kc on an exclusive amateur basis on 3.5 mc.

40 meters follows last month's prediction that at least 100 kc would be on a shared basis with high-frequency broadcasting services. Only it now looks like 150 kc will be shared. That means 150 kc that will be made useless to the American amateur unless we plan a campaign of maximum frequency utilization in that portion of the band.

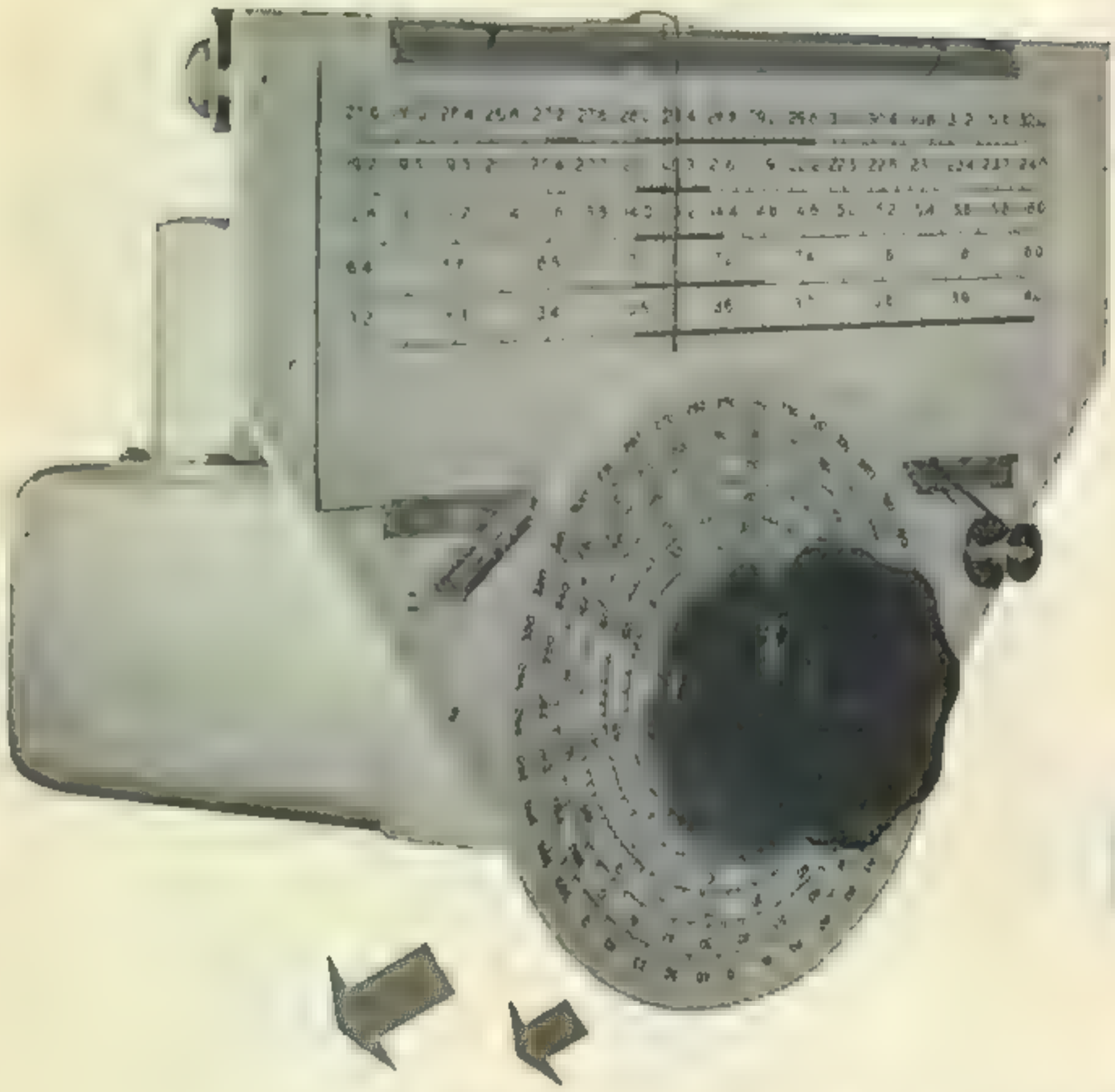
The depredation of 20 has been completed . . . At one time this band was considered "safe," but then a concerted attack was made for a 100-kc slice of 20 for other than amateur services. Final decision of the allocation committee calls for an outright cut of 50 kc, thus the new limits of 20 will be 14,000 kc to 14,350 kc. The date for this change will be announced later. Further, U.S.S.R. will share 14,250 to 14,350 kc with amateurs, using the space for fixed domestic services. An ironic clause calls for them to employ all necessary technical measures to minimize QRM to amateurs. As an active ham who has worked 20 meters consistently since the war we can recall that there have been numerous Russian commercials in the 20-meter band for some time and they caused terrific QRM all over the world. If the means to enforce U.S.S.R. observance of the footnote to the agreement are not emphatically stated, then we can anticipate the "liberal" Russian interpretation of the allocations, somewhat along the lines of their handling of other international agreements. At best, amateurs must anticipate severe C-W QRM from the Russian services. The bright spot in the picture, besides the prospects for 15 meters, is the wonderful fight put up by the official U.S. and Canada delegations in defense of the hams. The decision to accept the above terms for 20 was made only after a struggle in which it was recognized as the best alternative plan to full exclusive amateur occupancy of 400 kc. It is a bitter pill to swallow and there is much to be discussed and done when the conference has finished its work.

15 meters seems to be a pretty good bet as a new 450-kc band. The unfortunate argument that we are getting replacement frequencies which would justify cuts elsewhere seems to ignore the fact that our useful low-frequency short-haul bands are being made less usable all the time. We read one story in the *N. Y. Times* that a commercial company had made gifts to the heads of each foreign delegation of an all-band receiver. Ostensibly the receivers were to listen to special FM broadcasts, and perhaps that is all they were used for. But as we pointed out time and time again we must make more use of some of our frequencies if we are to hold them. Delegates who listened in on certain bands might have come away with a poor impression of ham utilization. We realize, as well as they must have, that many factors determine the degree of occupancy at any particular hour. Certainly 10 isn't to be compared now with the way it sounds during the winter. But in crucial negotiations such as these we must recognize the fact that every quiet band gives our detractors ammunition. We must stress again and again that flexibility is a necessity in the modern ham shack. We should use all our bands as conditions dictate. We must continue to prove our right to hold our frequencies!

A Better Looking CQ

IN THIS HOT sticky weather, sitting down and putting together a magazine isn't all it's cracked up to be. Deadlines, late delivery of paper, slower

(*Continued on page 74*)



New!

... a slide-rule dial for the 70E-8

The handsome new Collins-designed dial, which will be standard, now, on the 70E-8 v.f.o., is easier to read, and gives you greater mechanical band spread *and direct reading in kilocycles*.

Each band on the slide-rule has its own vernier scale below. On the 40-meter band, for example, one revolution of the dial changes the frequency 100 kilocycles. Each vernier division is one kilocycle. Direct reading is accomplished instantly by adding the reading of the vernier to that of the slide-rule.

An added feature is the method of zeroing the vernier hair-line, which has a screw-driver controlled adjustment on the panel to provide for exact calibration.

Note: Those who have bought the Collins 70E-8 v.f.o. with the fan-type dial may return it for replacement, free of charge, with this new slide-rule dial. Send it prepaid, well packed, tagged inside and out with your name and address, to "Customers' Returned Goods," Collins Radio Company, Cedar Rapids, Iowa. At the same time, write our Amateur Sales Department at Cedar Rapids, notifying us as to date of shipment.

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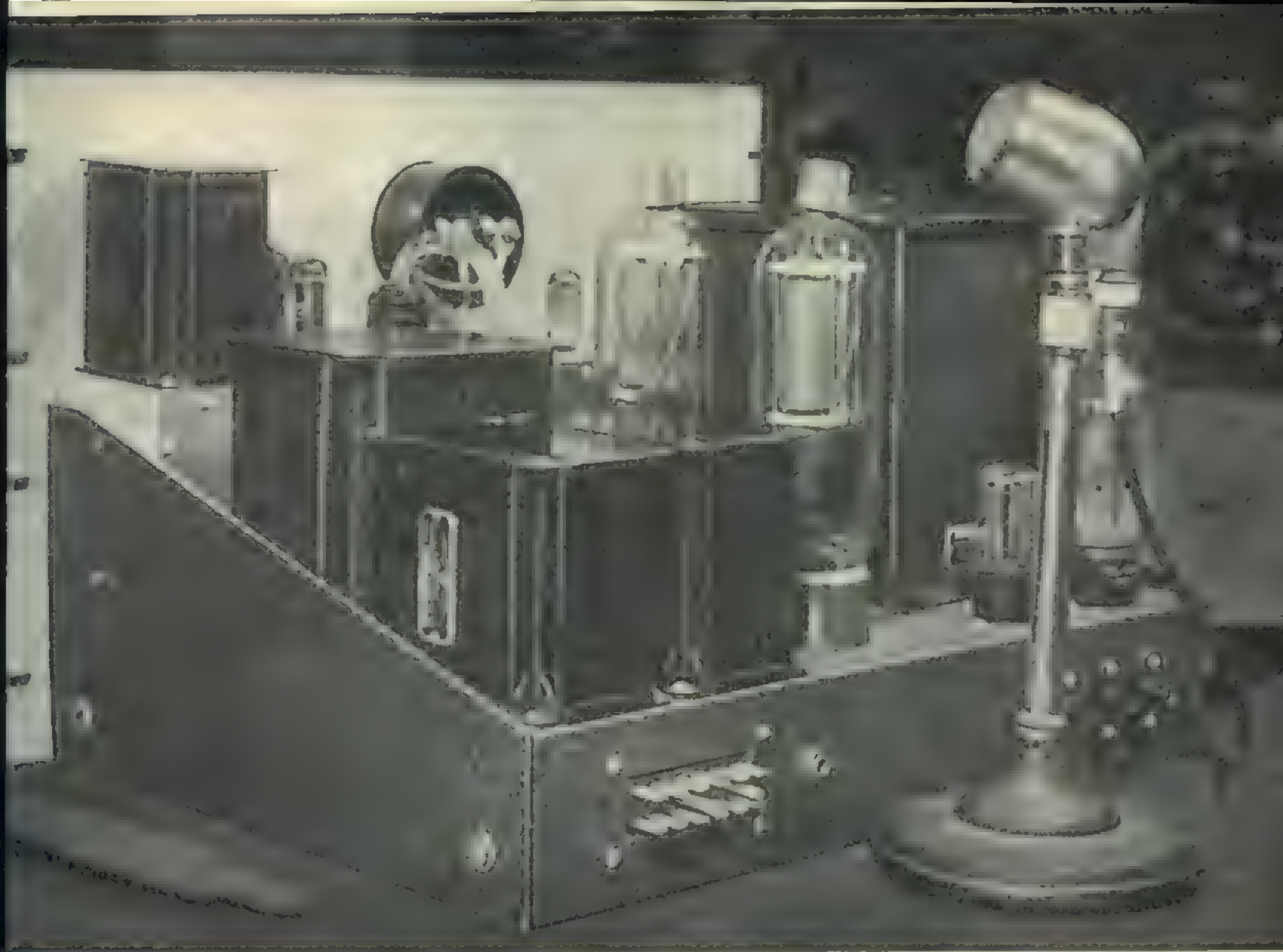


A Phone Man's Modulator

GEORGE H. FLOYD, W2RYT*

THERE IS NOTHING new under the sun as far as Class B modulator circuits are concerned—or is there? In a sense there isn't, as any new circuit idea seems to have only special uses, or perhaps is so revolutionary that no one cares to try it. After all, an input transformer, a pair of tubes, and an output transformer are the essentials of a Class B modulator circuit.

If a new modulator circuit hasn't been invented, how about an up-to-date mechanical arrangement of the parts, with just enough conveniences thrown in to make the whole thing practical and usable? Here then, is a phone man's idea of a modern Class B modulator.

Photograph A gives the panel view of the modulator. The extra switches and pilot lights are present because this unit acts as the master control for the rig, with filament ON-OFF and plate ON-OFF switches, as well as the PHONE-C.W. switch. The two knobs in the center control the speech amplifier, and the meter reads the plate current to the modulator tubes.

Including the speech amplifier on the same chassis as the modulator was something that the author had wanted to try for a long time. There are several disadvantages, usually, resulting from such an arrangement. For one thing, in order to work on the speech amplifier, it would be necessary to wrestle around at least a hundred pounds of modulation equipment. Also, if the speech amplifier were needed for some other job, it would not be available, at least in the portable category. Lastly; when the speech amplifier was rewired, as it usually is every year or so, there would be either a chopped-up chassis which would detract from the appearance of the modulator, or it would be necessary to completely rewire speech amplifier and modulator.

All of these points of objection were eliminated

*Tube Division, G. E. Co., Schenectady. N. Y.

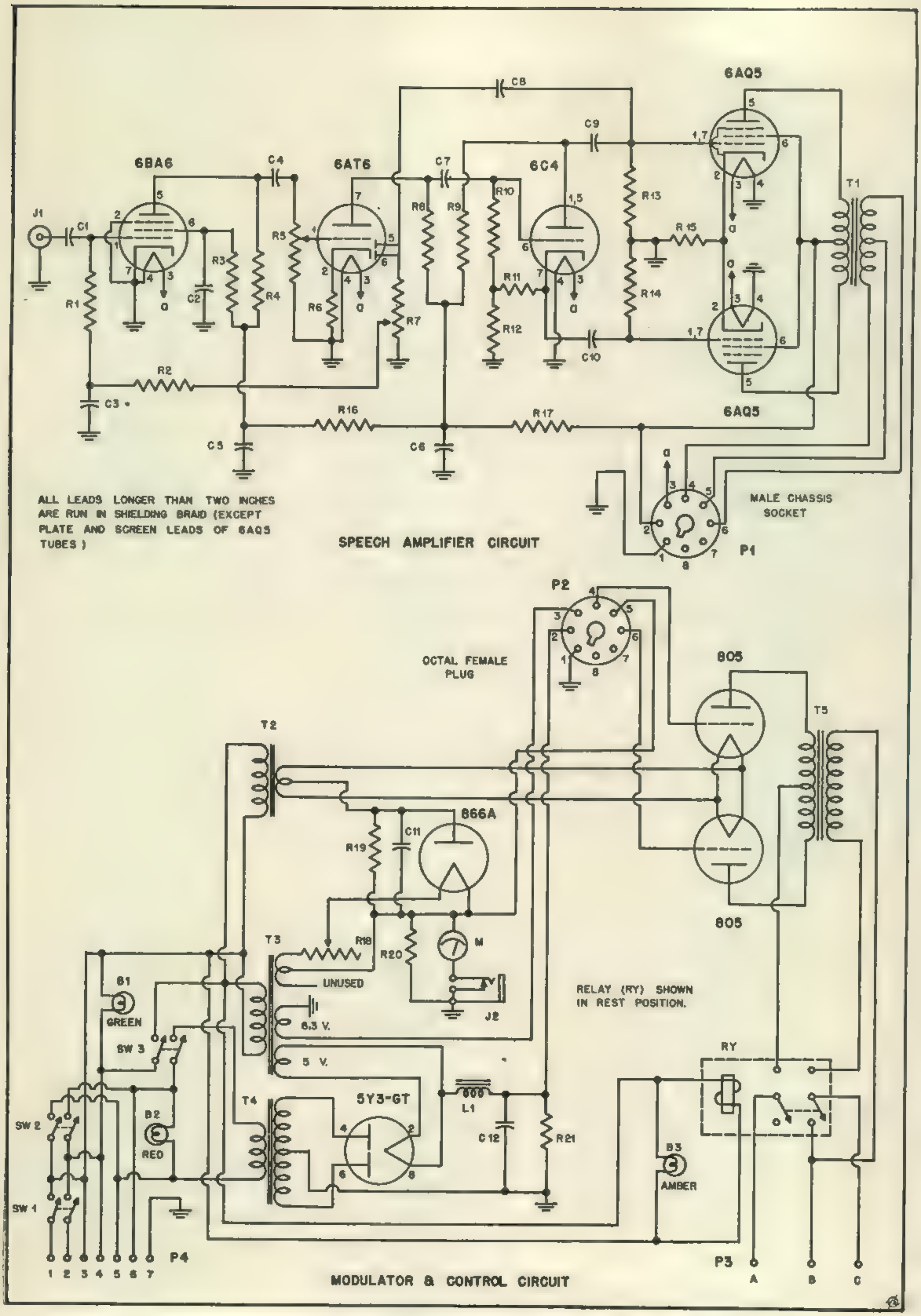
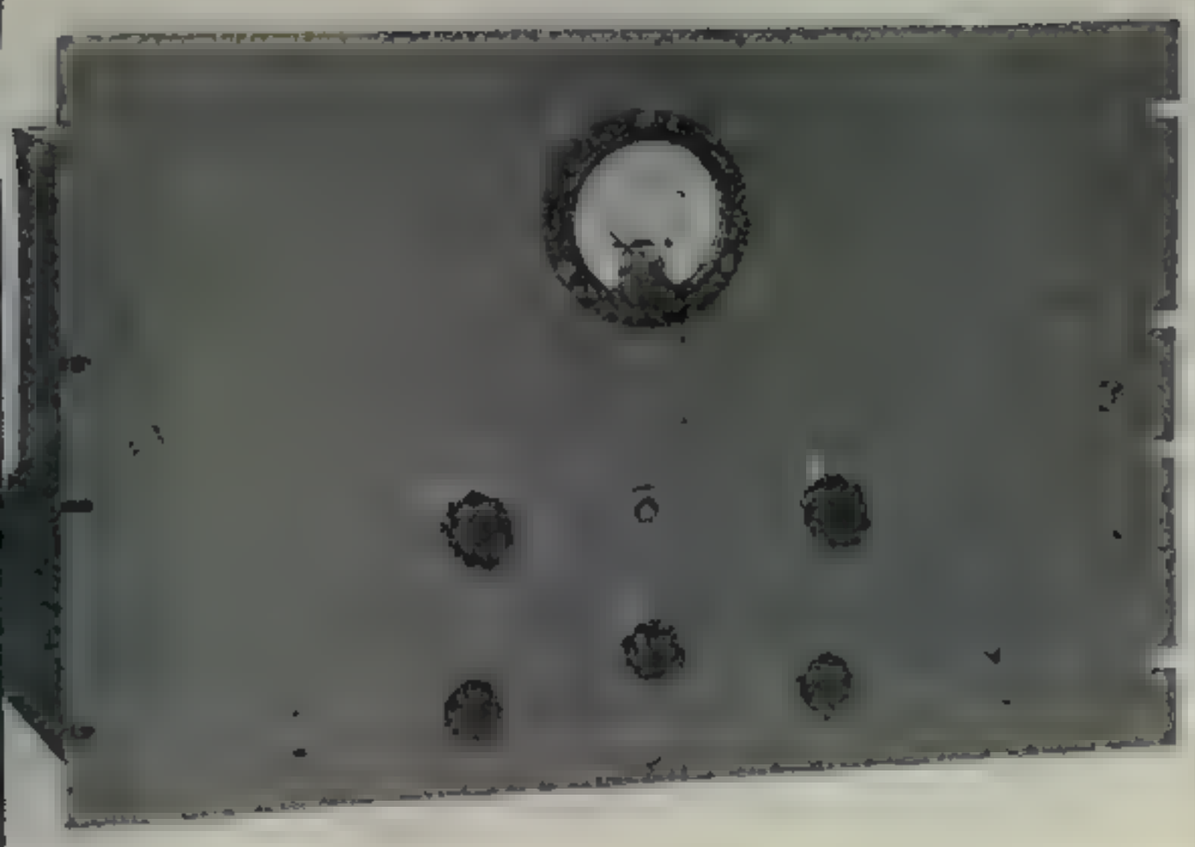
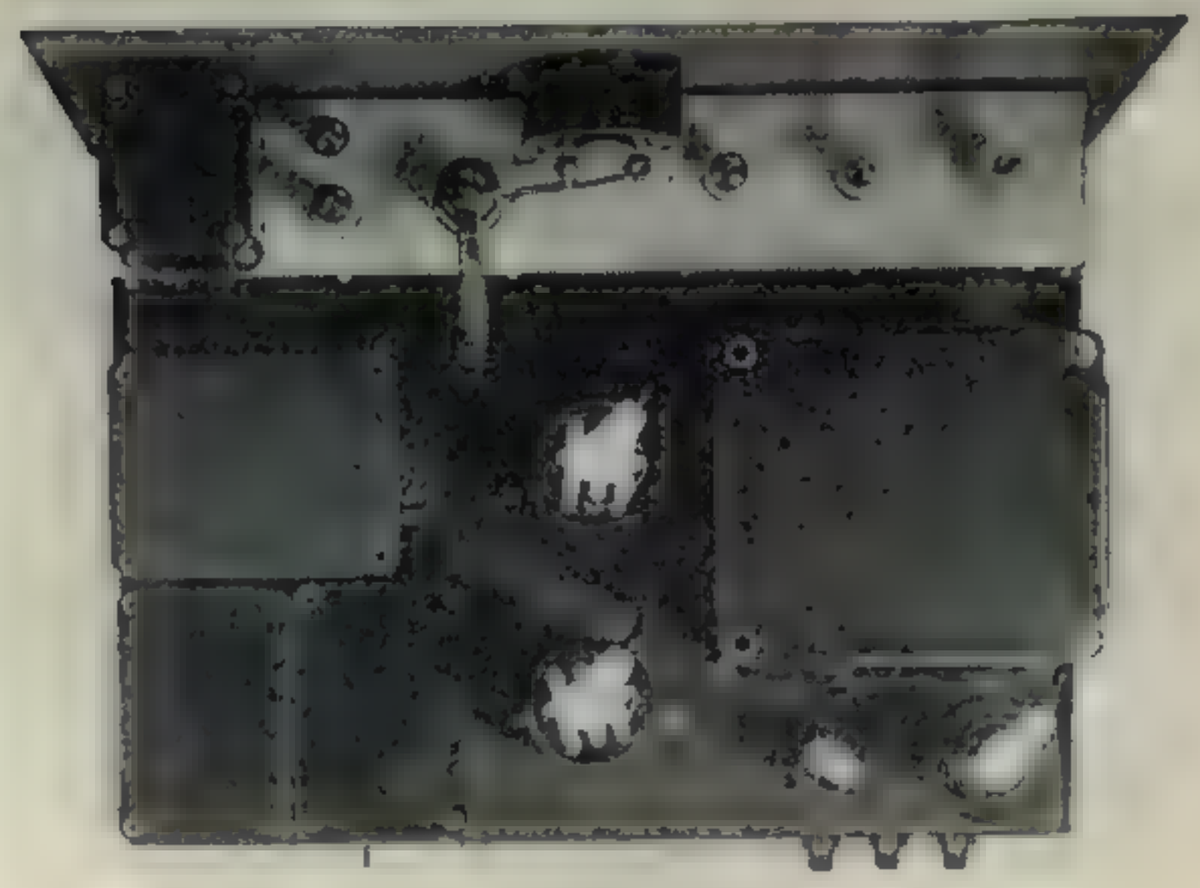


Fig. 1. Complete schematic diagram of the speech amplifier and modulator unit.





Photograph A (left). Front view of the modulator and speech amplifier. The filament switch and pilot light are on the left, and the plate switch and pilot light on the right. The center switch is the PHONE-C.W. switch, with the pilot light directly above. The knob on the left of the microphone jack is the gain control, while the control on the right is for A.M.C. The 0-500 milliampere meter reads modulator plate current. Photograph B (right). Top view of the modulator chassis and the separate speech amplifier chassis. The two 805 tubes are in the center, while the 866A and 5Y3-GT are located behind the modulation transformer.

Circuit Constants

B1, B2, B3—110-v. pilot lights.
C1, C4, C7—0.02 μf, paper.
C2, C3, C8—0.1 μf, paper.
C5, C6—8 μf, 450 volts, electrolytic.
C9, C10—0.01 μf, paper.
C11—100 μf, 50 volts, electrolytic (two 50-μf 50-v. condensers in parallel).
C12—20 μf, 450 volts, electrolytic (16-μf and-4μf in parallel).
J1—Microphone connector.
J2—Closed circuit jack.
L1—Smoothing choke, 10 h, 150 ma (Kenyon T-165).
M—0-500 ma meter.
P1—Octal male chassis socket.
P2—Octal female plug.
P3—Millen high-voltage terminals.
P4—Twelve point Jones plug.
R1, R2, R3—1 megohm, ½ watt.
R4—250,000 ohms, ½ watt.
R5, R7—500,000-ohm potentiometer.
R6—2,000 ohms, ½ watt.
R8—50,000 ohms, ½ watt.
R9—20,000 ohms, 1 watt.
R10—2 megohms, ½ watt.
R11—2,500 ohms, ½ watt.
R12—17,500 ohms, ½ watt.
R13, R14—470,000 ohms, ½ watt.
R15—250 ohms, 1 watt.
R16—5,000 ohms, ½ watt.
R17—2,000 ohms, 1 watt.
R18—1 ohm, 20 watts, semi-adjustable.
R19—100 ohms, 25 watts.
R20—10 ohms, 10 watts.
R21—9,000 ohms, 20 watts.
RY—High-voltage relay, DPDT, 110-v. coil (Leach 1557 MX).
SW1, SW2, SW3—Heavy duty DPST toggle switch.
T1—Driver transformer with primary to ½ secondary ratio of 3.7:1 (Kenyon T271).
T2—Filament transformer, 10 v. at 8 amps (Kenyon T361).
T3—Filament transformer, 5 v. at 3 amps; 6.3 v. at 4 amps; 6.3 v. at 4 amps. (Kenyon T376).
T4—Power transformer, 360-0-360 v. at 150 ma (Kenyon T215).
T5—Modulation transformer, variable match (Kenyon T496).

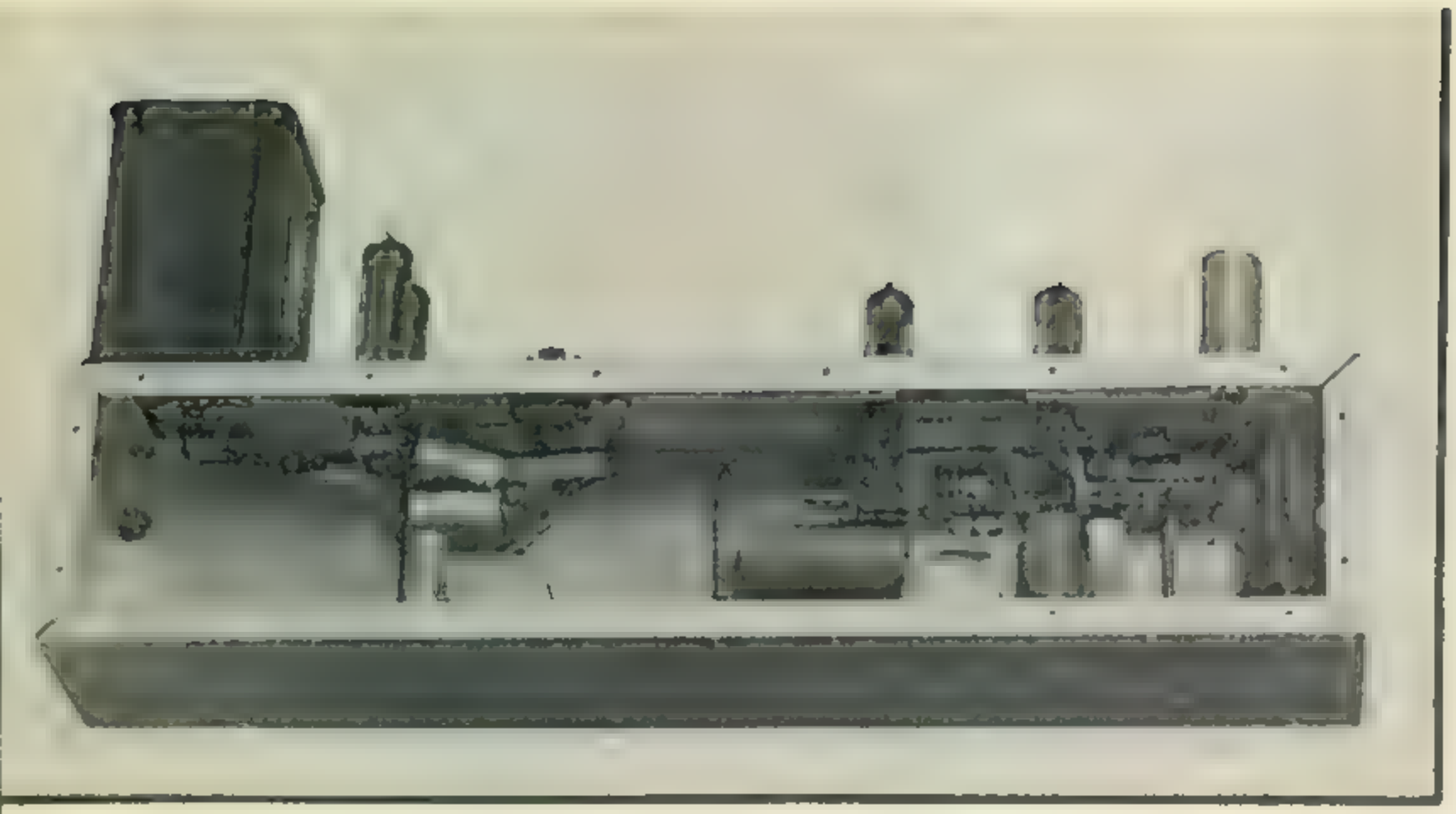
by designing the speech amplifier so that it fits on a small chassis, which may either be an integral part of the modulator unit, or removed and used as a separate amplifier. A standard 3" x 4" x 17" chassis mounted on its side is used. The photographs give the general layout. What is normally the top of the chassis becomes the side of the chassis upon which the controls are mounted. The bottom now becomes the back, and is covered by a piece of galvanized iron or aluminum. This back is not shown in the picture.

The speech amplifier chassis is large enough to accommodate enough tubes to drive a 500-watt modulator, unless transformer coupling is employed. The amplifier shown is designed around the new miniature tubes, although metal tubes could be used equally well, with a minor rearrangement of components. The entire speech amplifier fits quite nicely onto the modulator chassis, as may be seen in *Photograph B*. The angle brackets which fasten the modulator chassis to the front panel serve as the supports for the sub-chassis. To remove the speech amplifier, it is necessary only to remove the four self-tapping screws which go through the angle brackets, and remove the two knobs from the controls on the front panel.

The rest of the modulator is located behind the speech amplifier. The input transformer isn't present, as it is included on the sub-chassis. However, there are enough transformers to go around, as the power supply for the speech tubes is also included on the modulator chassis.

Circuit Details

The speech amplifier consists of two amplifier stages, a phase inverter, and a push-pull Class A driver stage. The input stage is designed around the 6BA6 miniature tube, a semi-remote cutoff tube which provides high gain as a voltage amplifier. A semi-remote cutoff tube was selected



Photograph C. Rear view of the speech amplifier chassis, giving mounting details for the components. Terminal strips are generously used to hold the components in place.

in order to achieve distortionless a-m-c action. The second stage, a 6AT6, acts as both the second amplifier stage and as a diode rectifier to supply the a-m-c bias for the grid of the 6BA6. A.M.C. (automatic modulation control) is incorporated because many hams insist on some automatic type of modulation control. For the old-timers that can't get used to the "new-fangled" stuff, a twist of the wrist is recommended—on potentiometer *R7*. When the arm of this resistor is grounded, there is no a.m.c.

Figure 2 gives an idea of how the voice compression system works. This a-m-c system is not complicated, but it will do a lot of compressing. Further, the amount of compression is easily adjusted by *R7*. If you have an urge to do a lot of whistling while testing, run *R7* all the way over and then see how much harder it is to make that antenna ammeter push up-scale!

Phase inversion for the push-pull drivers is furnished by a 6C4 cathode follower. This stage has excellent frequency response, and yet uses a minimum of parts. The output stage uses the new 6AQ5 miniature tube. This tube is the miniature equivalent of the 6V6 tube. A pair of 6AQ5 tubes in Class A provides 9 watts of power output, with a total harmonic distortion of less than eight percent. The entire tube lineup is modern in every sense. Yet, if it gets out of date, the small chassis can come out, and another take its place.

The selection of tubes to use as the Class B modulators was not a difficult one. The GL-805 tubes fit into the picture naturally, requiring zero bias at most voltages, and only a small amount of bias if they are to be pushed to their maximum input. In addition, full output can be obtained with only 7 watts of driving power. For smaller modulators, the GL-811 tube would have been chosen as it is a zero bias tube regardless of the voltage applied, and takes only 4.2 watts of driving power. Inasmuch as a high power modulator was required by the author, the 805 tubes have been used. With a plate voltage of 1500 volts, they have a rated power output of 370 watts, more than enough to modulate a full kilowatt where voice modulation is considered.

The circuit is standard in every respect, except for the bias scheme. Cathode bias, employing a GL-866A, furnishes a convenient and simple means of obtaining the bias voltage needed if the 805 tubes are to be pushed to full output.* The peak voltage drop in a typical 866A is 15 volts, which gives us enough voltage to keep the 805

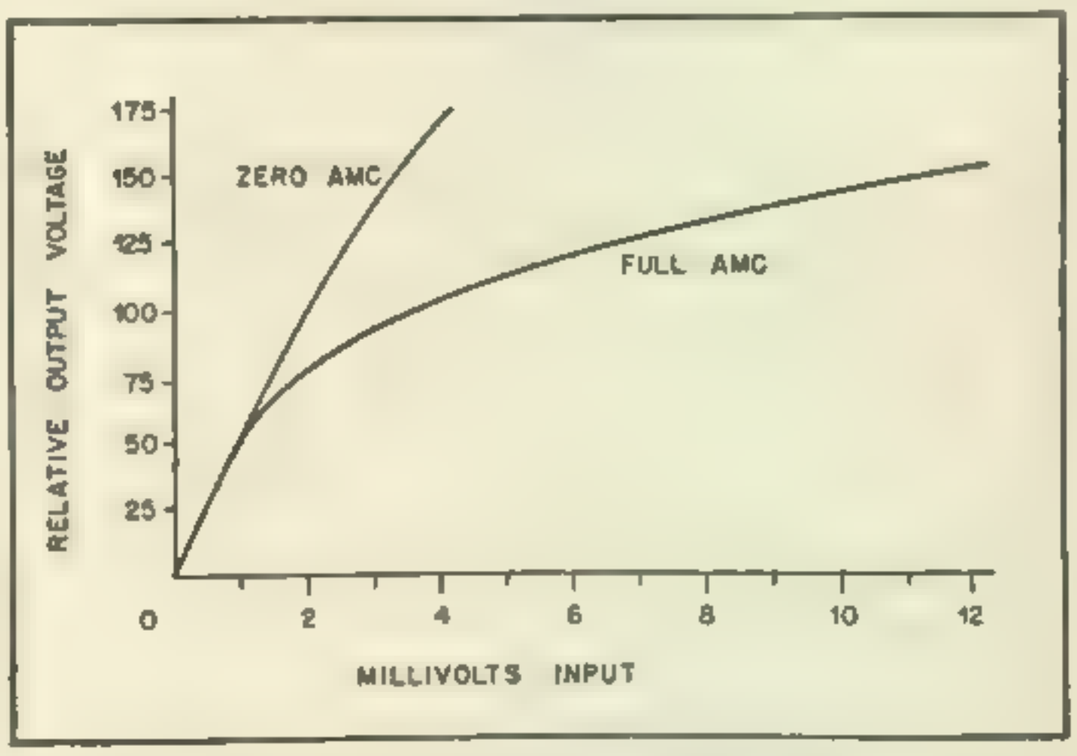


Fig. 2. Automatic modulation control characteristic curve.

tubes under control. In the event that only 300 watts of audio is required, the 805 tubes can be run at 1250 volts and zero bias. The 866A would not be required, and the center-tap of the filament transformer (*T2*) could be connected directly to the meter and its shunting resistor. Resistors *R18*, *R19* and condenser *C11* could be omitted.

A 5Y3-GT tube is used as rectifier tube to supply plate voltage to the speech amplifier tubes. A single choke, *L1*, feeds a resistor-condenser filter network consisting of *C12* and *R21* on the modulator chassis, and *R17*, *C6* and *R16*, *C5* on the speech amplifier chassis.

A twelve-point Jones plug (*P4*) serves as the input plug and output plug for a.c. Terminals 1 and 2 are the main a-c input. Filament a-c leads for use in the rest of the rig come out on terminals 3 and 4, while terminals 5 and 6 serve the same purpose for the plate a.c. Terminal 7

CQ Magazine, March 1947, "*Electronic Bias for Class B Modulators.*"

is a ground point, and also may be used as the negative connection for the high voltage leads.

Switch SW 3 acts as a PHONE-C.W. switch, applying voltage to all transformers on the modulator chassis only when it is in the "Phone" position. This switch also controls the high voltage relay (*RY*) which removes the modulation transformer from the circuit for c-w operation. The high voltage terminals, A, B and C (*P3*) are used as follows. Voltage for the 805 tubes connects to terminal A. The Class C final plate voltage from the power supply connects to B and terminal C carries the modulated voltage back to the Class C stage.

Octal plugs are used to connect the modulator chassis to the small chassis. This six-wire line carries the plate voltage to the speech amplifier tubes, as well as the output of the driver transformer. The center tap of *T1* is carried into the modulator chassis so that the meter in the cathode circuit of the 805 tubes will read plate current only, which would not be the case if the transformer center-tap were grounded in the speech amplifier chassis. The filament power for the speech amplifier tubes similarly comes from the modulator chassis.

Jack *J2* is a remote takeoff to read modulator plate current. This makes it convenient to mount another 0-500 milliameter on the operating table to monitor your modulation. When a meter is connected to *J2*, both meters are in series. Resistor *R20* provides a cathode return to ground for the modulator tubes if the meter circuit is accidentally opened.

It will be noted that the filament transformer, *T3*, does not have a 2.5-volt winding. It was therefore necessary to use a 6.3-volt winding to supply filament power to the 866A. Using one-half of that winding, it is necessary to drop the 3.15 volts down to 2.5 volts. This drop of .65 volts requires a resistance of 0.13 ohms, so a 1-ohm 20-watt semi-adjustable resistor (R18) was used. This seems like a very high wattage, but the actual resistance in use is very small, and it is necessary to dissipate 3.25 watts in the .13 ohms of resistance used.

Mechanical Considerations

This modulator is no harder to build than any metal-chassis unit, and no special work of any kind need be done, with the exception of the flat piece of metal which covers the back of the small chassis. *Photograph C* gives the essential wiring information for the speech amplifier. The shielded tube is the 6BA6, and the other tubes in line are the 6AT6 and the 6C4. An octal male chassis socket is placed next so that it will be convenient for unplugging. The 6AQ5 tubes are mounted next to the driver output transformer. Placement of parts is not critical but it is advisable to shield all leads which are more than an inch or two long, with the exception of the plate and screen leads of the 6AQ5 tubes. The tube socket diagrams in *Fig. 1* indicate that for several of the tubes one element connects to two pins. In each case where this occurs the two pins were tied together. For example, the plate of the 6C4 tube ties to pins 1 and 5. The plate connection to this tube was therefore made to both pins.

In *Photograph C* may be seen a large hole in the front face of the chassis. There are four of these holes, placed so that they clear the large screws which hold the front panel to the two angle brackets. In this way, the small chassis may be brought flush to the front panel. Although not shown in the photograph, ventilation holes near the 6AQ5 tubes would help in keeping the chassis cool. Two holes in the top and two in the removable back should do the job.

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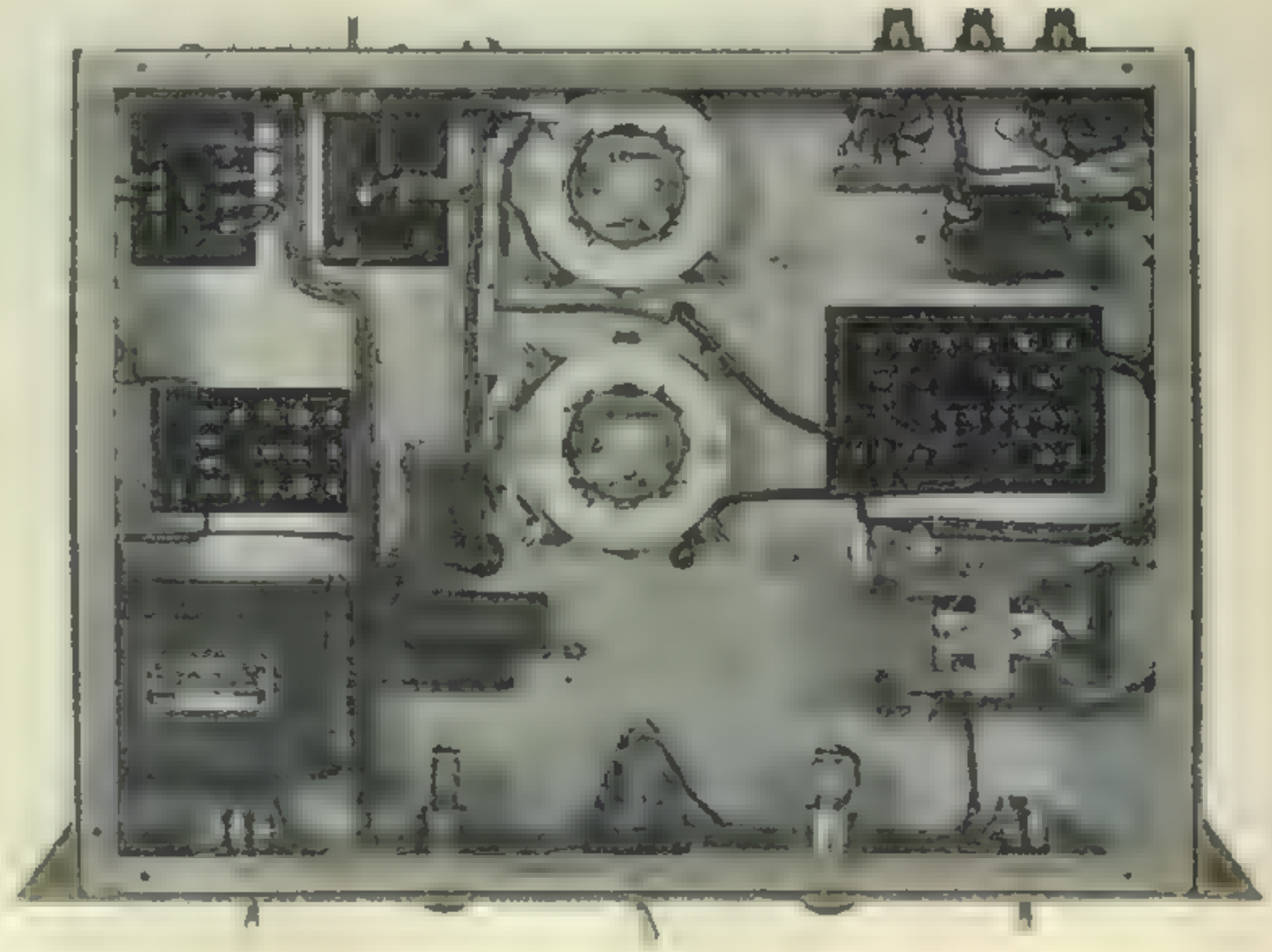


Photograph D. Under-chassis view of the modulator chassis. Neat wiring is made possible by the proper placement of parts.

How to Win Friends

EUGENE BLACK, JR., W2ESO*

Proper use of the semi-automatic key is dependent on careful adjustment of all moving parts to individual preference.

IF YOU'RE a c-w man eventually you get a "bug." In ham radio, the starting speed for bugs seems to be about fifteen w.p.m., (averaged over any 30 second period), and the urge to use a bug seems to come after a few weeks or so on c.w.

Be that as it may, of all the things that go to make up a ham shack, probably the one standard item through the years has been the bug, and learning to adjust and handle the semi-automatic key has been a perennial beginner's problem. As usual, there is no substitute for experience, which means practice in this case, but perhaps the following will make the introductory period a bit easier.

The Basic Adjustments

As far as adjustments go, there are about a dozen different ones that *can* be made on a bug, and these should be checked in the following order.

The first three, the position of the moving dot contact, the position of the moving dash contact, and the setting of the pivots, are usually assumed to be correctly set at the factory. The setting of the contacts on the lever should not be disturbed unless repositioning is obviously required to permit one or the other pair of contacts to close squarely. Correct setting of the trunions can be checked by observing that the lever is centered in a vertical plane, and that there is a barely noticeable amount of play at the bearings. The important thing here is that there should be no trace of binding.

The next item on the list is the normal (rest) position of the lever itself, which is determined by the lever stop, labelled *A* in *Fig. 1*. The stop should be run out just far enough to let the lever rest against the damper; it should never be run out enough to permit the flat spring strip to bend visibly.

The next set of adjustments, covering dash and dot swing and tension, depend somewhat on personal tastes, and are usually modified from time to time until the operator definitely determines his particular requirements. The beginner usually finds it best to start with a fairly wide throw and moderate tension, on both dash and dot sides, gradually narrowing the swing to make rapid sending easier, as he picks up skill and confidence.

The dash spacing, (*B* in *Fig. 1*), and dash tension (*C* in *Fig. 1*), should be adjusted first. This can best be done by hitching the bug to your keying oscillator and sending Os, 9s, Os, etc., until you hit a setting you like. (Notice that we haven't started preaching about *not* using the bug on the air until you know how to use it; heck, if any ham ever got his hands on a bug for the first time and failed to splatter dots all over the band with it at once, we never heard of him. So go ahead—we dare you—get it out of your system in one night, or better yet, one daytime. Show yourself that you don't know how to use it, and then go back to your audio oscillator until you know you can get by with the bug without balling up a QSO too badly.)

Adjusting the Dots

When it comes to making with the dots, there are four factors entering into the adjustment. These are: tension (*D* in *Fig. 1*), the dot lever stop (*E* in *Fig. 1*), the setting of the dot contact screw (*F* in *Fig. 1*), and of course the setting of the weight or weights. You will observe that there is an interlocking effect of the last three. The proper procedure is to set the tension and stop to appropriate starting points; keep the weight(s) at the end of the pendulum arm for a slow dot rate, and then run in the dot contact screw to the point where swinging the lever to the dot side will produce a train of from seven to a dozen dots, ending with the circuit closed. At higher dot speeds, more dots will be made before the lever comes to rest, but it should stop with the contacts closed at any speed.

While tension and lever travel are matters of personal preference, the setting of the dot contact and consequent dot "weight" is pretty arbitrary, inasmuch as the length of a dot is supposed to be equal to the space between successive dots. There is no single setting of the dot contact screw which is precisely correct for all dot speeds, as you can easily find out, but a reasonable compromise can be obtained if the dot contact is adjusted with the weights set for some intermediate speed. When using the bug on the air, you will find there are several additional factors which will affect the optimum dot weight. These include not only conditions QRM, QRN and fading), but most important, the keying characteristics of your rig, including a keying relay, if you use one. These all add up to make a heavy dot desirable, and in general, the dot contact screw should be run in as far as possible, consistent with even spacing between dots and sending that is not "muddy."

Incidentally, if you use your receiver as a keying monitor, make your initial checks of dot length

*449 W. 56 St., N. Y. 19, N. Y.

With a Bug

with the receiver input shorted. Most receivers, given a fairly large input voltage as from an adjacent transmitter, overload in both the preselector and i-f channels, drawing grid current through the a-v-c decoupling resistors. The time constants of these circuits are often long enough to give a false picture of what is taking place at high keying rates.

Send in Comfort

Most of the fundamentals of sending with the straight key apply also to the bug. Enough space should be allowed at the operating position to permit the forearm to be rested comfortably. The main habit to acquire is that of letting the arm do most of the work. The hand should be used as a "paw," and most operators have found it best not to hold the knob and paddle at all—the thumb and fingers are kept fairly wide apart. This insures that the lever will return to center by itself, when released, and eliminates the possibility of following up a series of dots with an undesired dash, or vice versa.

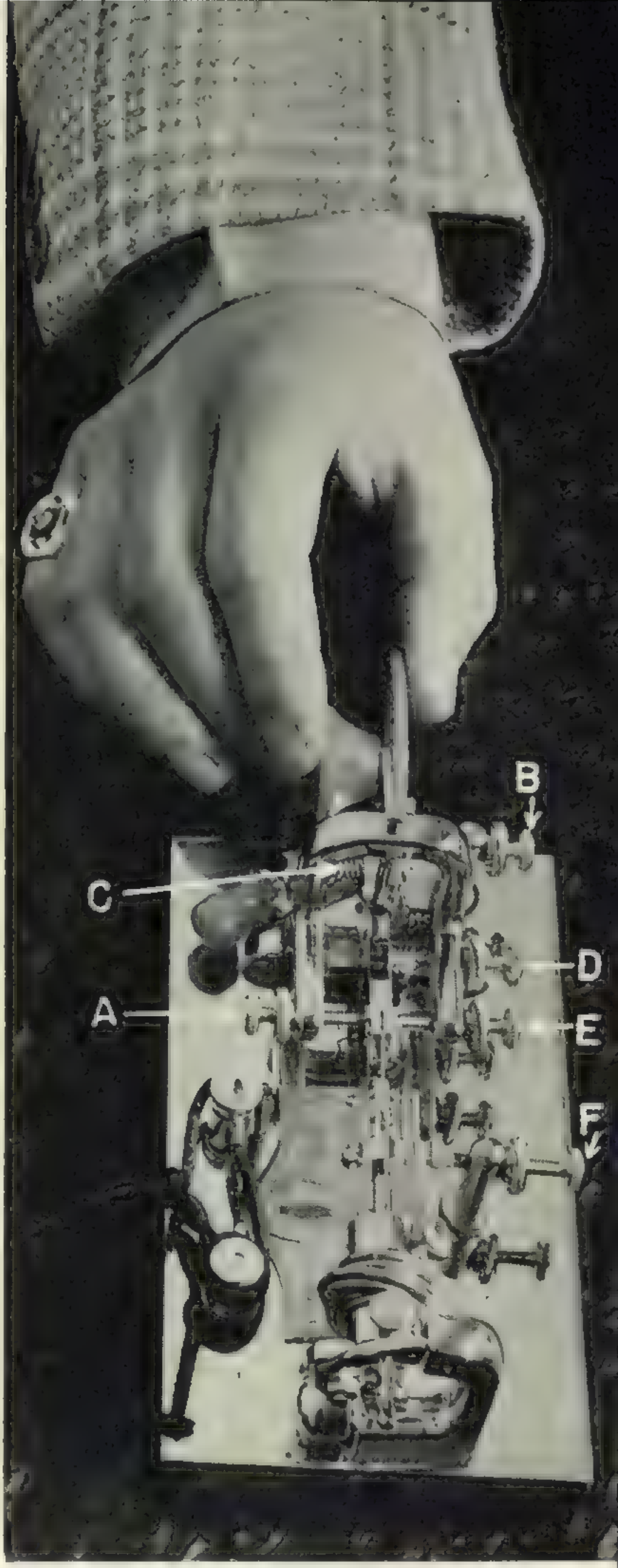
As the photographs show, it is possible to load the bug down with solder to permit slower than normal speeds; a small clip will also do the job nicely. This additional weight can be removed as soon as the operator gets the knack of handling the key; the bug was never intended to eliminate the straight key entirely, and should always be teamed up with a straight key on the operating table. This leaves the bug properly set for high speed work and available for it at all times.

You wouldn't expect anything to be around as long as this creature has been, without collecting some sort of list of "improvements" and innovations. Some operators don't care for the knob, which is a holdover from straight key tradition, anyway, and replace it with another thumb paddle. Still others throw away the knob, shave down the paddle and then pad the whole thing up with several layers of adhesive tape.

The lighter models have a tendency to walk over the operating table when keyed. Among the various remedies proposed in the past have been the following: setting the bug on a sheet of sandpaper tacked to the operating desk, cementing the rubber feet to the desk, adding additional feet to the bug to increase the area in contact, and tacking small strips of wood to the top of the table to cradle the thing. Recently something resembling a thin sheet of beeswax has been put on the market, and seems to do a good job.

A number of schemes have been introduced in the past to simplify changing dot speed. These include such ideas as making a sliding weight by removing the set-screw, and adding a small piece of spring stock bearing on the shaft with just sufficient tension to hold the weight in place when set, or on models with round shafts, filing a flat on the shaft

(*Continued on page 84*)



Principal operating adjustments of the semi-automatic key are identified by letter, as described fully in text. The imprint of a small bug, appearing on the name plate of the original manufacturer of this type key, has given rise to this more commonly used term describing it. The bug imprint still appears on all Vibroplex keys, whose deluxe model is shown.

600 Miles on 2!...

BERNARD SWEDLOFF, W3EKK*

The story behind the new 2-meter DX record of W2PAU, W2PFQ, W3EKK and W3KUX.

During August, 2 meters took a cue from 6 and opened for some real DX. Unfortunately, lack of amateur activity at the time of the opening peaks prevented some extraordinary hauls. WØHAQ in Davenport, Iowa, heard taxi and police services in the 150-160 mc band from N. Y., N. J. and San Antonio and Ft. Worth, Tex., and Los Angeles. W9ZHB, Zearing, Ill., worked W8WJC, W8MLE, and W8UKS in the Cleveland area, for the longest midwest hauls ever made. He heard W3GV, Erie, Pa., and was heard by W3GV, but unfortunately no QSO took place. Other reports are arriving and it is very possible that this 600-mile record won't last long. Nevertheless, the article is a valuable treatise on planning long distance v-h-f work. Details of other 2-meter work are given in the V.H.F. column.

EVER SINCE 2 METERS was opened for amateur use speculation has been rife as to the capability of this band for DX work—if a few hundred miles can be considered DX by an amateur fraternity to whom round-the-world contacts on the lower frequencies are commonplace. The writer had ample opportunity to observe v.h.f. and microwave gear in action during the past few years and, as a result, had a well justified hunch that many surprises were in the offing when the higher frequency bands became more fully settled and exploited. The first year's activities on the 2-meter band brought a preview of what might be expected, as the DX record was stretched to well over 300 miles. There followed a winter of purely local activity during which time the gang was gradually weaned from super-regenerative receivers and modulated oscillators to sensitive superhets and stabilized transmitters.

As stations in the more densely populated areas swung their new equipment into the fray the consistent service area of a given station stepped out in leaps and bounds and the DX record began to climb past the 400-mile mark.

It did not take too much study to convince us that the only way to start getting the results we were aiming for would be to set up the best station that we could afford atop the best possible location that we could reach. A number of QTHs were discussed including Mt. Washington, N. H.; High Point Mountain, N. J.; Slide Mountain, N. Y., and Mt. Cadillac, Me. After a year of procrastination the decision was made in favor of Mt. Cadillac, for many reasons, which included temperature gradients and a long overwater path, although results obtained tended to disprove that a long over-water path would give us a head start.

It was about a year and a half before this organized attempt on the two-meter record was made that the operating combination of W2PAU (ex-W1IRV), W2PFQ (ex-W3JTJ), and W3EKK, came into being. Bound together by a mutual love for the v.h.f.s and hatred for radiating receivers, master oscillators, and CQ hounds, etc., this trio formed a mutually benevolent, but otherwise anti-social society, for the promotion of bigger and better mobile expeditions to prove the worth of 2 meters. Pooling our resources and abilities we started to plan for the super-mobile station and an assault on the DX record.

Selection of Equipment

The biggest problem seemed to be the selection of suitable means to power our set-up. Experiences with using the car battery for a power source were generally unsatisfactory.

The problem was finally solved by the purchase of a 600-watt unit from surplus at a very reasonable price. By removing the shelf from the car trunk, and rearranging the spare tire, it was easy to carry the generator in the car and to operate it while in motion.

The receiver problem was solved by the purchase of a surplus BC-639. Basically this receiver is the same as the popular SCR-522, differing principally in the fact that it is designed for manual tuning. The tube line-up is similar to the 522, plus the addition of a b.f.o. The front end and the first two i-f stages were given a complete revision. The r-f stage wound up with a 6AK5, and a 6AG5 mixer. The first two i-f transformers were overcoupled by design, and gave a pass-band of around 150 kc. These cans were removed and the last two i-f transformers of a pirated 522 were modified and substituted. The net result was a pass-band of about 50 kc. This seemed to be narrow enough to cut down

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QRM, yet wide enough to permit the reception of some modulated oscillators, and still prevent the line pulses of the generator from swinging the signals all over the dial. The "S" meter circuit was changed to provide greater meter sensitivity, and the a-v-c delay removed to make the meter responsive to weak signals.

The sensitivity was hard to measure as the leakage of the signal generators used was one of the limiting factors. However, a signal of less than one-tenth micro-volt was detectable using the b.f.o. We used several signal generators of different manufacture, including the Measurements Corp. Model 80, the Ferris 18-D, and a special Measurements job with a coaxial attenuator, before arriving at this conclusion. A signal of .25 micro-volt on the 70-ohm input line produced an S-1 indication on the meter. The meter was then calibrated in steps of 6 db per "S" point. This was later to cause great consternation on the band when we started to hand out reports like Q5 S2!

The full tuning range of the receiver was retained, as the FM, mobile service, beacon stations, etc., on frequencies near the ham band provided a good means for checking purposes when no ham signals were audible. They were also useful in predicting band openings because long experience had shown that certain effects on the 100-mc FM band were invariably followed in four or five hours by a 2-meter band opening.

The basic transmitter started out to be a 522. To get more output, an 829-B replaced the 832 final. This took more drive than was available, so another 829-B replaced the 832 tripler-driver. 6V6s were put into service in the oscillator and the harmonic generator. 80 watts input to the final was now available. The modulators were now inadequate and 6L6s replaced the 12A6s. A 6J5 driver and a 6J7 speech amplifier plus a crystal mike completed the transmitter lineup. The same treatment was applied to another 522, and a more conventional rig using a 2E26 to drive an 829-B was contributed by W2PAU. The three transmitters were deemed necessary to satisfy the legal requirements so that all three calls could be used from the same location. Conventional 110-volt power supplies were used with all rigs.

Field Tests

A conference to decide whether the test antenna would be a 32-element beam or a rhombic ended in a draw, but most of the actual work was with the rhombic. Inasmuch as the majority of stations in our expected service range were using vertical antennas of one sort or another we naturally concentrated on vertical rhombics. We set up in the sand flats of southern New Jersey to check the various antennas that we had put on paper. The first attempt with a vertical half rhombic, using a counterpoise to provide a good ground for the terminating resistor, and having legs 8 wavelengths long, ended in failure. It did not compare to the 16-element antenna and was too tricky to tune. The next day we were again set up in the same spot with the makings of a full, vertical rhombic. This one had sides 4 wavelengths long, (approximately 26 ft.), a tilt angle of 65 degrees, and stood 22.4 ft. high. It was fed by a quarter wave matching section and 300-ohm Amphenol line. Because low power was used during the tests (3-watts input,) we were able to terminate the rhombic with a 2-watt carbon resistor.

From the onset the performance was excellent. The antenna loaded the rig with no trouble. The comparison with the 16-element beam was made on receivers at points several miles away. The receivers had previously been calibrated with signal generators so that the conditions under which the tests were conducted were as uniform as we could make them. In each case a distinct improvement over the 16-element beam was noted, with opinions ranging from 3 db to 6 db gain. These tests settled the antenna problem because the 3 db minimum gain recorded was the equivalent gain we would have realized by going from 16 elements to 32 elements, and the 6 db figure by going to 64 elements. The objection will probably be raised that the rhombic is too sharp. Working on the assumption, backed by

Atop Mt. Cadillac, Me., from left to right: B. Swedloff, W3EKK, J. Blake, W2PFQ, and E. Brown, W2PAU.

W3EKK
is
QRT

checks, that the beam width to the half power points was 20 degrees wide, at the range of 500 miles, our pattern would cover from Atlantic City, N. J., on the east, to Harrisburg, Pa., on the west. When we centered the beam on Philadelphia and Washington, D.C., our results from Mt. Cadillac substantiated these figures.

The expedition dates had tentatively been chosen to fall during the latter part of September as the time when conditions would be at their peak, but fate, in the guise of plant-wide vacations, decreed that if W2PAU and W2PFQ were to go at all it would be during the two weeks of July 27th and August 3rd.

Prior to the departure date, W2PFQ's Olds, vintage of '37, W2PAU's Plymouth, same vintage, had been worked on in an attempt to place both vehicles in first-class shape for expedition, Gon Ku Ku. Both of these noble steeds had served us well on earlier forays, although in deference to their advanced age it was deemed advisable to split the payload between them in the well-known push-pull arrangement. This gave us a diversity factor which was to prove invaluable in the northern lands where service stations, and junk yards, were few and far between. As it worked out, the push-pull theory was in operation most of the time. One or the other was either pushing or pulling in an attempt to get the other going. At least as far as the nearest junk yard.

On the Air from Mt. Cadillac

We arrived at midnight, and after stumbling blind over the rocks, we had our rhombic up and the station ready to go. We had shot Polaris, and were ready to shoot each other before an agreement was reached on the proper method of declinating our compass. The receiver was turned on and the band given a whirl. Not too much activity but at least we picked up a few weak carriers with the b.f.o. The stations heard were down Boston way and although they didn't seem to be aware of our existence it showed that our choice of location wasn't a complete washout and that the future looked promising. Leaving the antenna standing we closed station and headed for our base camp at the foot of the mountain for some well-earned sleep.

We ate in shifts and at 8:10 p.m. on the 30th of July, while Joe and Brownie were gouging themselves, a CQ brought forth a call from W1AUC operating from his car in Trenton, Me. We passed along a report and stood by for a report on our signals. The answer was "About an S8, I can't give you an accurate report. I never heard any other signals on this band." About this time a crystal signal was heard calling and it turned out to be W1BDF on Nantucket Island. "Hmmm," thought we, "this looks like a good night." As we signed with Ed, W1MNF was heard calling us and a QSO was made with Earle. Both these stations were pushing the "S" meter to S6 and S7 and we happily thought of all the juicy QSOs we would pile up that night. As it turned out, conditions were not as good as we thought.

We were to discover that when the signals were rolling in well from Cape Cod and Nantucket, signals coming from the Boston area and other inland locations were either completely absent or way down in level. A few other stations from the Boston area were worked that night, although their signals were down in the mud. Around 1 a.m. we called it a day and closed stations. A confab was held the next morning and we decided to take it easy until Saturday when we would again set up and operate through the weekend. We spent the time visiting, fishing and storing up sleep for the coming weekend.

Saturday afternoon we started off with W1BDF at 2:55 p.m. and as the day wore on we worked quite a number of stations in Me. and Mass. Business was even better on Sunday and over fifty stations in N. H., Me., Mass., Conn., and R.I. were worked.

We were off the air for auto repairs most of Monday, but settled down for an uninterrupted evening of operating. That night we had a really good session. Word had finally got around that we were operating from Maine and just about every station in the first district swung its beam at us to get another state. We took on all comers, working them as fast as we could and before the smoke died down that evening we felt the trouble and effort to which we were put had been well repaid. That night, Monday, August 4th, we had an even hundred QSOs as we worked all over New England with strong signals. We finally signed off at 2:00 a.m. Tuesday, as by this time activity had died down and we had worked all the stations we could hear.

We finally got on the air at 9:00 p.m. Tuesday to start another busy night. Our first CQ was answered by W1DAH in N. Scituate, R. I., and there followed another flurry of QSOs with New England stations. Our best DX to date had been W1OSQ, in Milford, Conn., c.w. on his end and fone on ours. We were beginning to wonder whether we would bring back that record after all. Time was running short and in the next day or two we would have to start back again. But fate and conditions were kind. At 10:55 p.m. that night we finally worked out of the first district. W2ADW was the call and we pounced on him like a long lost AC4. He told us that W2RH was also hearing us but we couldn't hear W2RH that night.

The New Dx Record Is Set

Wednesday night we got on the air at 9:50 p.m. and W1KIM informed us that the band was open to the second district for the first time since we had

(*Continued on page 70*)

The Amateur Newcomer

HOWARD A. BOWMAN, W6QIR, and WILLIAM A. GODDARD, W6AKQ

Construction and theory of operation of a two-tube audio amplifier.

IN THE SECOND installment of this series there was described a very simple receiver which would operate a pair of headphones but which would not operate a loudspeaker. It was pointed out that loudspeaker operation required greater power than was obtainable from a simple detector, and that this increased amplitude could be obtained by means of vacuum-tube audio amplifiers. The amplifier described herein will serve that purpose.

This two-tube amplifier is so designed that it may also be used as the amplifier for a vacuum-tube detector to be described in the next article of this series. The amplifier will also be used to modulate a complete transmitter to be described in a later article.

The same latitude in the matter of selection of parts is possible in the construction of the amplifier as was possible in the construction of the power supply, provided that approximately the same values of resistors, capacitors, and so forth as listed are used.

Inasmuch as the purpose of this series is to enable the reader to become familiar with certain basic principles, we shall first consider the theory of amplification.

Vacuum Tubes

In the power supply we found we could make use of a diode vacuum tube as a rectifier because of one very important property: the tube would pass current in one direction but not in the other. In this way it is seen that the tube is primarily a control device. Tubes which are more complex than the diode serve different purposes other than that of rectification but fundamentally they are all control devices.

It will be recalled that current flow within the diode consisted of a stream of electrons moving from a hot cathode or filament to the plate. This flow occurs for two reasons: (1) the cathode has the ability to emit electrons when heated, and (2) the plate is charged positively, attracting large quantities of the negatively charged electrons. (Actually, a small current flow will occur when the charge on the plate is zero, but this is of no immediate practical importance.) In the case of the rectifier no current flow takes place during the negative half cycle, because of the fact that the negative charge of the plate repells the negative electrons.

One way to control the flow of current within the diode is to vary the charge on the plate, whereupon the tube will act something like a resistance, so long as the plate is positive. Another and more effective way to control the flow of electrons within the tube is to place a third element between the cathode and the plate, upon which the electric charge may be varied. This third element is called the "grid," the name being derived from its appearance, since it consists of wires shaped to form a grid mesh through the holes in which the electrons may pass without difficulty. If the charge on the grid is made slightly positive, more electrons are encouraged to travel to the plate than would be the case if the grid were absent. If the charge on the grid is removed or made negative, the number of electrons reaching the plate is correspondingly reduced. In fact, if the grid is made sufficiently

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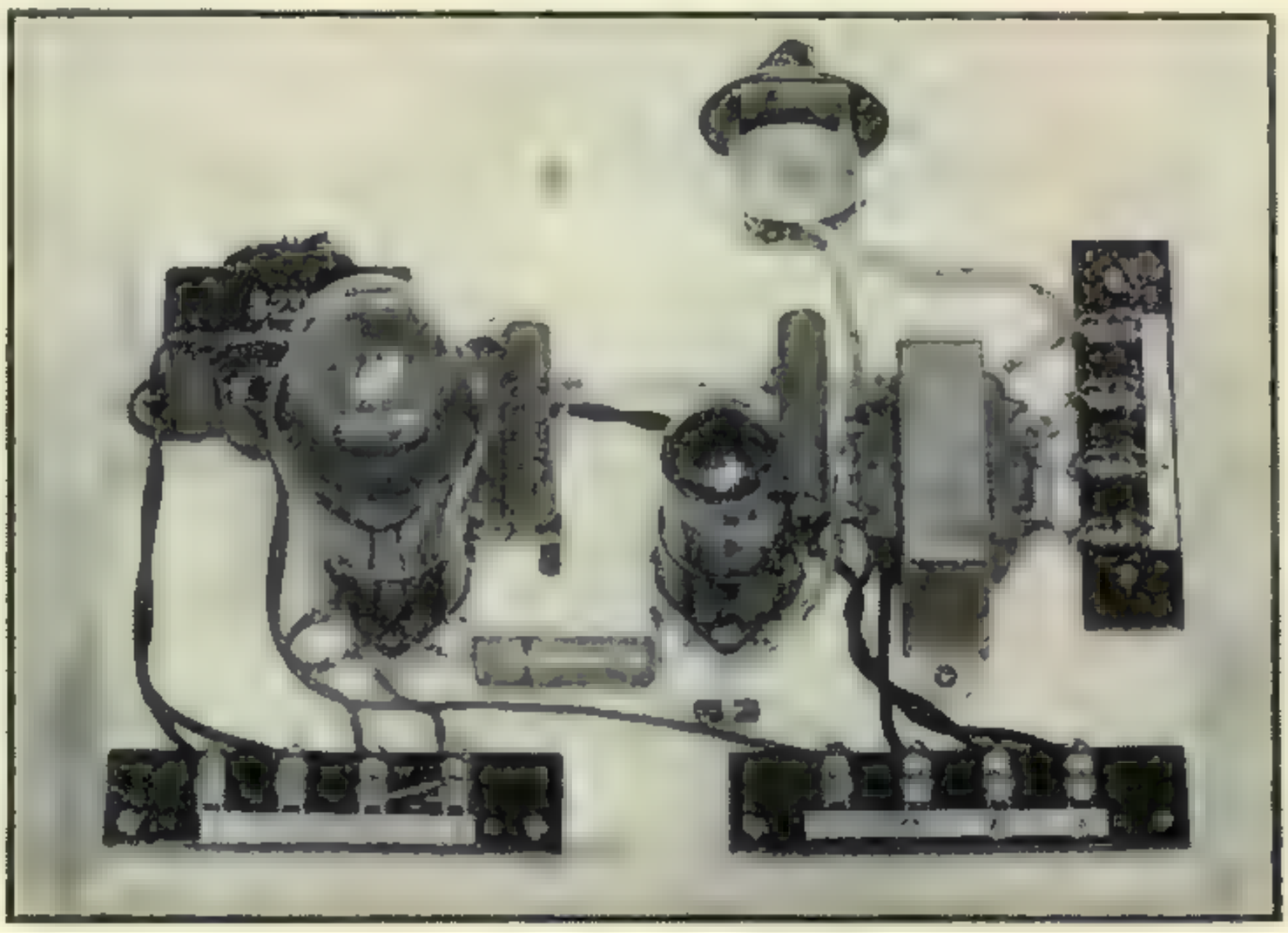


Audio amplifier, top view. Terminals at right are input, lettered "G," "1," "2," "3." Terminals at right below are for power input; terminals at left below are audio output, as described in text. Note use of shielded wire in input circuit and ground bus of heavy wire to which ground returns are made. Jumper across terminals 7—6 must be in place when amplifier is used to feed a speaker. If omitted, tube may be damaged when power is applied.

◆ ◆ ◆

Complete receiving setup showing, left to right, speaker and crystal receiver, audio amplifier, and power supply. Note volume-control panel on audio amplifier. Power supply switches are in "off" position.

negative, the electron flow may be cut off entirely. When a vacuum tube has three elements—cathode, grid, and plate—it is called a "triode."

With the triode we have a means of controlling a certain amount of current through the tube itself, and also through its external circuit, by applying a small amount of grid voltage. The grid is nearly always maintained slightly negative for a reason to be explained later, and this fixed voltage is called the "grid bias." Thus it is seen that the grid will draw only enough current to vary the charge on it, requiring almost no power to control the plate current of the tube.

Referring to *Fig. 1*, we shall investigate the manner in which a vacuum tube amplifies. The cathode of the tube is heated by current from a source not shown in the diagram, but applied at points *X-X*. The source of plate current is the "B" battery and in *Fig. 1* (*a*) the plate current flows through the plate milliammeter *M*. Between the terminals *A-B* let us apply a small voltage which may be varied, starting with the negative terminal applied to the cathode and the positive applied to the grid. As the voltage increases the plate current will be seen to go up until a maximum value is reached and further increase in grid voltage produces no corresponding increase in plate current; we shall have reached the useful limit of plate current, for we are getting to the plate nearly all of the available electrons from the cathode. If, now, we reverse the polarity of the applied grid voltage and follow the same procedure, we reach a point at which no more plate current will flow; we will then have reached "cut-off" grid bias. In between these two limits is the useful range of the tube. Careful performance of the above experiment would show that there is a region in which the increase (or decrease) in the plate current is practically proportional to the increase (or decrease) in grid voltage. This generally occurs when the grid is slightly negative and for this reason an amplifier tube is operated with the grid initially negative. As was stated above, this initial negative grid voltage is called the "grid bias."

In *Fig. 1*(*b*) the required grid bias is applied by means of the "C" battery, and in place of the meter in the plate circuit there is substituted a resistor, which we shall call the "load resistor" for the tube. If the voltage across the terminals *A-B* is now increased (*A* made more positive than *B*) the plate current will increase, but the situation is slightly different from that previously discussed. The plate current must flow through the load resistor and the voltage drop ($E=I \times R$) across the resistor will increase. If the voltage across the terminals *A-B* is decreased the plate current will decrease, producing a corresponding decrease in the voltage drop across the resistor. From this it should be understood tha a variation in the grid voltage will produce a corresponding variation in the voltage across the plate load resistor which is greater than the voltage change which initiated it. This is voltage amplification.

The circuit of *Fig. 1*(*b*) may be used to amplify an alternating voltage applied to the grid of the tube and, if desired, we may substitute for the load resistor some reproducing mechanism such as headphones or a loudspeaker. The alternating current in the plate circuit will cause the diaphragm of the head phones to vibrate in accordance with the alternating signal voltage on the grid.

Multiple Element Tubes

From the preceding discussion it is evident that the vacuum tube will amplify, and that this ampli-

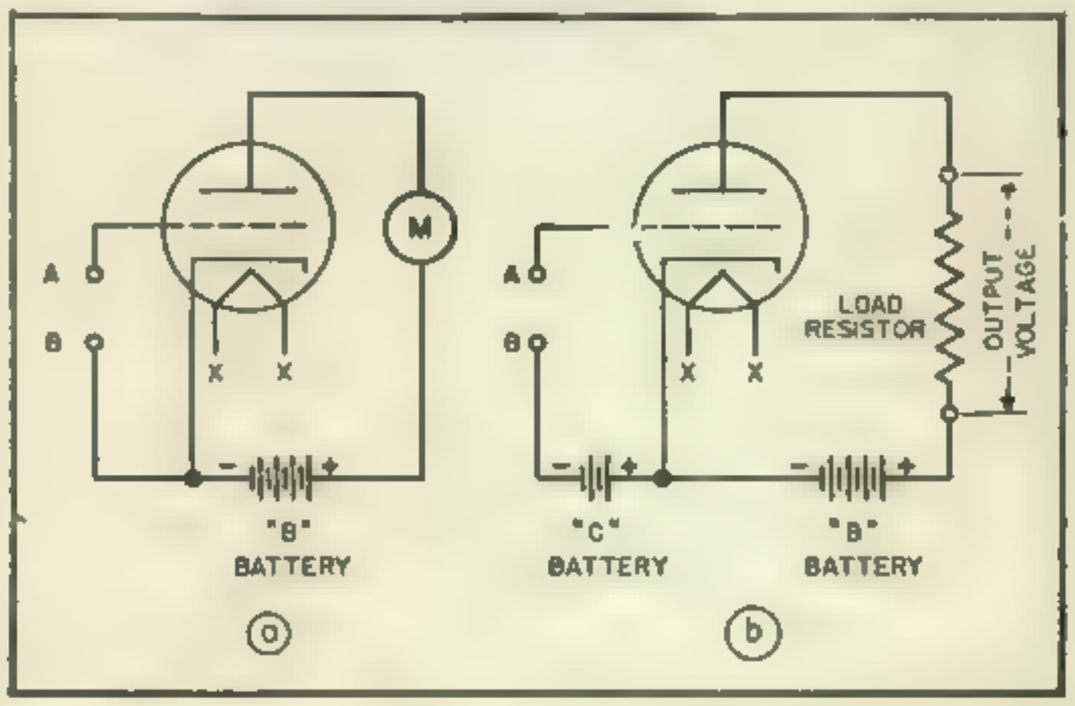


Fig. 1. Operation of vacuum tube amplifier (see text).

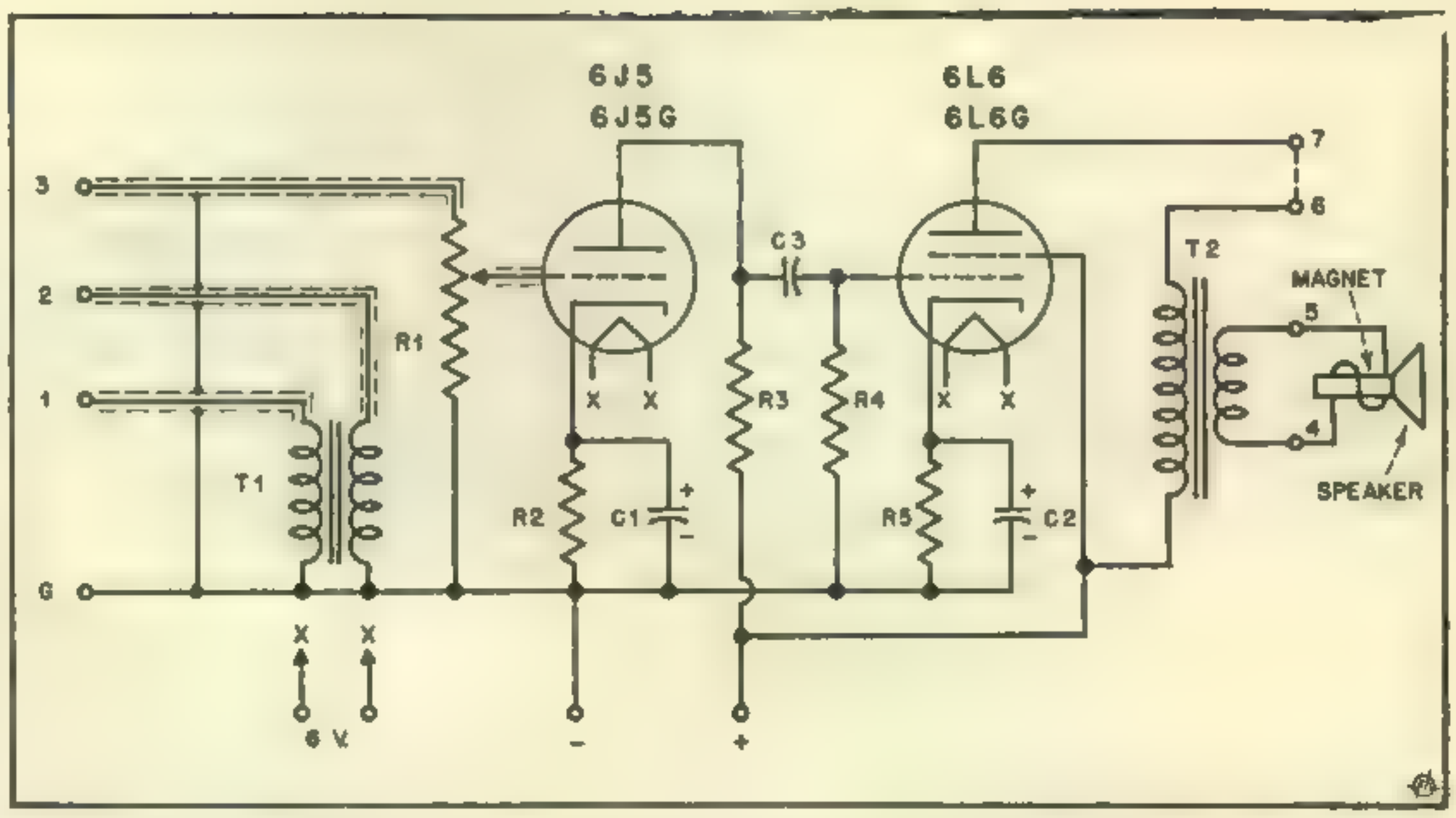


Fig. 2 Circuit of the audio amplifier

C1, C2—10 μf, 25 volts, electrolytic
C3—0.02 μf, 600 volts, paper
R1—0.5-megohm potentiometer
R2—2500 ohms, ½ watt
R3—0.1 megohm, ½ watt
R4—0.25 megohm, ½ watt
R5—200 ohms, 10 watt
T1—Audio transformer, 3:1 ratio
T2—Universal output transformer
Speaker—5" permanent magnet

fication depends upon the ability of the grid voltage to control the plate current. This amplification may further be said to be dependent upon the relative ability of the grid to control the plate current as compared to the ability of the plate voltage to control the plate current. This relative ability for a given tube is called the amplification factor for the tube and is designated by the Greek letter "μ" (mu).

In order to increase the amplification it is necessary to make the grid more effective in the control of the plate current. This is done in several ways. If the wires forming the grid are more closely spaced, any charge placed upon the grid will more closely control the plate current; high-mu tubes have closely spaced grid wires. Another way to increase the relative effectiveness of the grid is to decrease the effectiveness of the plate; this is done by placing another element between the grid and the plate, screening the plate from the cathode and the other grid. A positive charge is generally placed on this grid in order to facilitate the flow of electrons, but this positive charge is kept constant. Some electrons actually reach the second grid, but most of them go on through to the plate. This fourth element within the tube is called the "screen-grid" and such four-element tubes are called "tetrodes."

Although the amplification factor of such tubes is greater than can be obtained in triodes, one serious difficulty arises due to a mechanical property of the electrons themselves. After they have passed through the screen-grid they are moving at a very high rate of speed and some of them bounce back off the plate, finally arriving again at the screen. This peculiar action results in a plate-current flow which is erratic under certain conditions. To reduce the possibility of such "secondary emission" by the plate, a third grid is added between the plate and the screen. This third grid is called the "suppressor grid," and it is usually maintained at the potential of the cathode, or is slightly negatively charged. The negatively charged suppressor repels the positively charged electrons which have bounced off the plate. Tubes with three grids are called "pentodes."

One type of tube which behaves somewhat like the pentode, but which has only two grids, is the "beam" tube. In these tubes internal metal shields, connected to the cathode, are arranged in the tube in such a way that a beam of electrons is directed toward the plate. The principal advantage of the beam power tube is high-power sensitivity.

Triodes and pentodes are used for both voltage and power amplification. Beam tubes find their widest application in power amplification. In the amplifier we are to construct we shall make use of a triode voltage amplifier and a beam -tetrode power amplifier.

Audio Amplifier Circuit

Vacuum tubes may be used to increase the amplitude of electrical oscillations over a very wide range of frequencies, from zero cycles per second (direct current) up to many thousands of megacycles per second. When the term "audio" is used relative to an amplifier it means that the frequencies to be amplified lie within the range of the human ear, normally between about 16 and 16,000 cycles per second. The circuit constants selected for the amplifier cause it to be most effective in amplification over this frequency range.

Fig. 2 shows the wiring diagram for the audio amplifier to be constructed. Probably the best way to understand its operation is to go through it step by step and see what actually happens.

If there is applied between the ground terminal *G* and terminal *3* a small alternating voltage which has the same frequency characteristics as the sound to be amplified, this voltage will be applied across the voltage divider *R1*. Part of this input voltage is applied to the grid of the first tube, the 6J5. As the tap on *R1* is moved the voltage applied to the grid is varied; the voltage divider, or potentiometer, *R1*, is the volume control for the amplifier. As was seen above, a small variation in the grid voltage produces a corresponding variation in the plate current through the load resistor, *R1*, which in turn causes a variation in the voltage drop across it. With alternating voltage being applied to the grid of the tube, alternating voltage is developed across the load resistor.

The alternating voltage across the load resistor is applied through the combination of the capacitor, *C3*, and the grid resistor, *R4*, to the next amplifier tube, the 6L6. At audio frequencies the

reactance of the capacitor is negligible or very small as compared to the resistance of *R4*, with the result that nearly the entire voltage developed across the load resistor of the 6J5 is applied to the grid of the 6L6. The alternating grid voltage on the 6L6 causes a corresponding variation in its plate current. In the plate circuit of the 6L6 we find the primary coil of the output transformer. The alternating plate current in the transformer primary induces voltage in the secondary winding of the transformer which is applied to the "voice coil" of the speaker.

The speaker consists of two parts, the permanent magnet and the movable coil to which the cone is attached. When current is passed through the coil the magnetic field created about the coil causes it to move toward or away from the magnetic field. When alternating current is passed through the coil the coil and cone will vibrate at a frequency corresponding to that of the a.c. being applied, producing sound waves in the air about the speaker.

The voice coil of this type of speaker consists of only a few turns of wire and it presents a fairly small impedance to the flow of alternating current; usually this impedance is about 6 ohms. To operate the amplifier tube efficiently its load resistance or impedance should be of the order of several thousand ohms; the tube used in our amplifier should operate into a load of about 2500 ohms. To satisfy this condition some device must be used to match the impedance of the speaker to the tube. This is the function of the output transformer. The impedance ratio required here is 2500/6, or about 416 to one. Since the impedance ratio varies as the square of the number of turns, the ratio of primary turns to secondary turns is $\sqrt{416}$, or about 20 to 1. Purchased output transformers usually come with the matching data in tabular form, the necessary information being the type of tube used and the output impedance (speaker input impedance) required.

Obviously there are some parts of the circuit which have not been explained, namely the resistors and capacitors in the cathode returns of the tubes. These resistors provide the necessary negative grid bias for the tubes, this system being used in place of battery bias. The plate current for each of the tubes is drawn through its cathode resistors and the voltage drop through the resistor provides the bias voltage. To calculate the required resistor value it is necessary to know the recommended bias for the plate voltage used and the plate current the tube will draw.

Reference to the RCA Tube Manual shows that the 6L6 will draw 75 ma for the plate and 6 ma for the screen when the plate voltage is 250. It also shows that the grid bias should be —14 volts under these conditions. This bias voltage must result from the drop across the cathode resistor due to the total current through it, both screen and plate; this is 81 milliamperes (0.081 ampere). Application of Ohm's Law gives the resistor value as 14/0.081, or 173 ohms. This checks with the recommended value in the manual. In practice, the nearest available standard manufactured value is used. The cathode bypass condenser is used in each stage to prevent some of the alternating output voltage from appearing across the cathode resistor, as this would cause degeneration and loss of amplification.

In the determination of resistor and capacitor values for audio amplifiers it is common practice to refer to the data given in tabular form in the tube manuals (RCA Tube Manual pp. 198-202, etc.). This data covers a wide variety of operating conditions for all tubes now generally used.

Construction

The parts for the amplifier are mounted on a 1-inch pine base measuring 8 x 11 inches. It was not found desirable to mount any of the parts or run any of the wiring under the board. The terminal

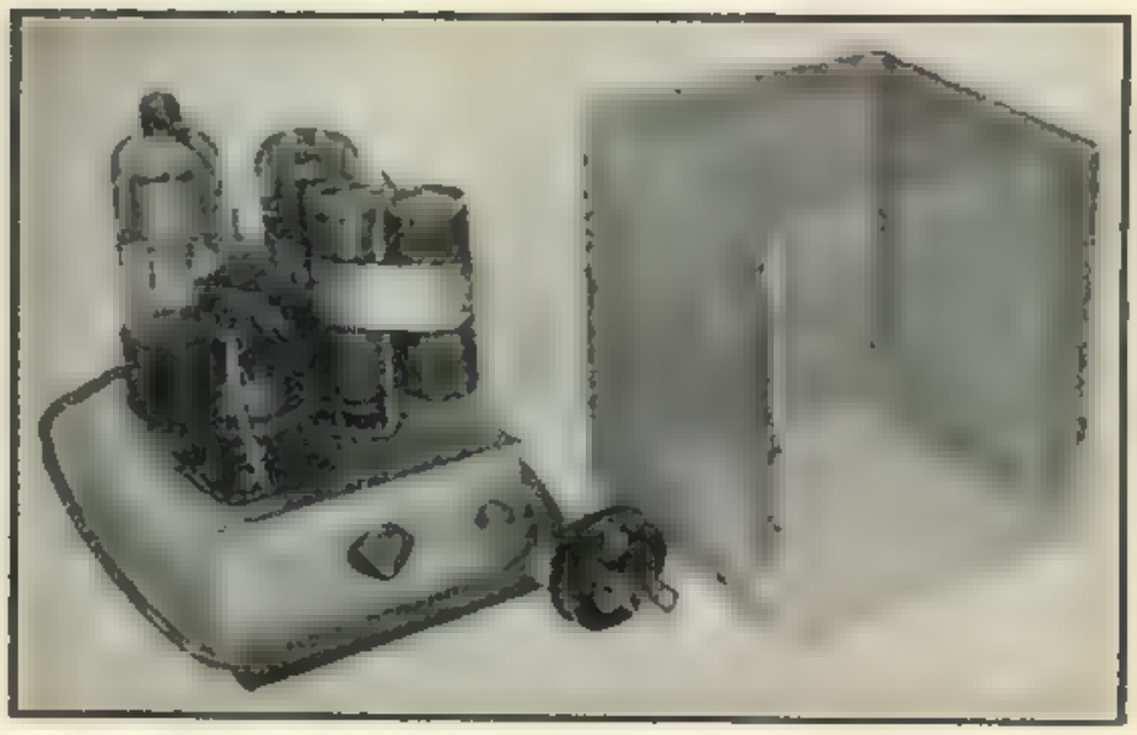
(*Continued on page 79*)

Members and friends of the Frankford Radio Club, numbering among them many of the country's most active amateurs. (*Members of FRC.) . . . . . *Front Row:* W3EER*, EP1C, W3FLH*, W2QKE*, W3CBT*, W3PN, W2RSO, W3IXN. *Second Row:* W3CHH*, W3KT*, W2FXN*, W2OXX*, G6CL (Secretary of RSGB), W3BES*, W3FUF*, W2QCL*, W3MFM*, W3GRS*, W2PG. *Third Row:* W3DOU, W3HFD*, W3EM, W3BXE*, W2HEH*, W3NAH*, W2RDK*, W3EVT, W3JBC*, W3JSU*. *Back Row:* W2PWP*, W2SAI*, W2AQW*, W3DWR, W3CPV*, HC1OE, W3GHD*, W3GYV*, W2PIN*, W3EQA*, W3AGV*.

A High-Voltage Radio-Frequency POWER SUPPLY

L. T. RHODES*

A handy tool in any shack where work with cathode ray tubes is planned.



THIS ARTICLE describes a high-voltage radio-frequency power supply which requires no special componenets and can be easily constructed with parts from any ham's junk box. Output voltage is 2500 with a load current of .5 milliamperes which is sufficient for any 3" and most 5" scopes. The usual safety precautions must be observed.

The complete unit weighs less than one pound and requires two tubes, one 117L7GT and a 8016. Cost of the completed supply is less than a similar 60-cycle supply.

Circuit Description

Looking at the schematic, *Fig.*1, the beam power section of the 117L7GT is operated as a power oscillator. Between the plate winding, *L*1, and feedback winding, *L*2, is located a 125-mh choke coil, *L*3. *L*1 is tuned with *C*1 so that the circuit operates at the resonant frequency of *L*3 and its stray capacity which is approximately 290 kc. The high voltage from this circuit is rectified by the 8016 tube which secures its filament power from the oscillator.

The diode section of the 117L7GT, *C*3, *C*4, and *R*2 serve as the d-c plate supply for the oscillator. Since the filament of this tube operates directly from the 117-volt line it requires no power transformer. This reduces cost and overall size with shield to 3½" x 3½" x 5½", which is about the size of a similar high-voltage 60-cycle power transformer alone. Care has been taken in the design so that neither side of the power line is grounded.

The supply is very stable in operation with its output voltage adjusted by *C*1. Only one .005-μf condenser and a wire screen shield are needed to eliminate r-f interference with other circuits used in the equipment. The shield is also a safety factor.

Theory of Operation

The operation of cathode ray tubes requires high voltage at a very small current, usually under 1 ma. At these high voltages, which vary from two thousand for small tubes to twenty-seven thousand for television projection tubes, conventional 60-cycle transformers, chokes and condensers become very bulky. The transformers must be better insulated for these higher voltages which produce corona. In the design of these transformers it also becomes uneconomical to wind very small wire and consequently the supplies can usually furnish many

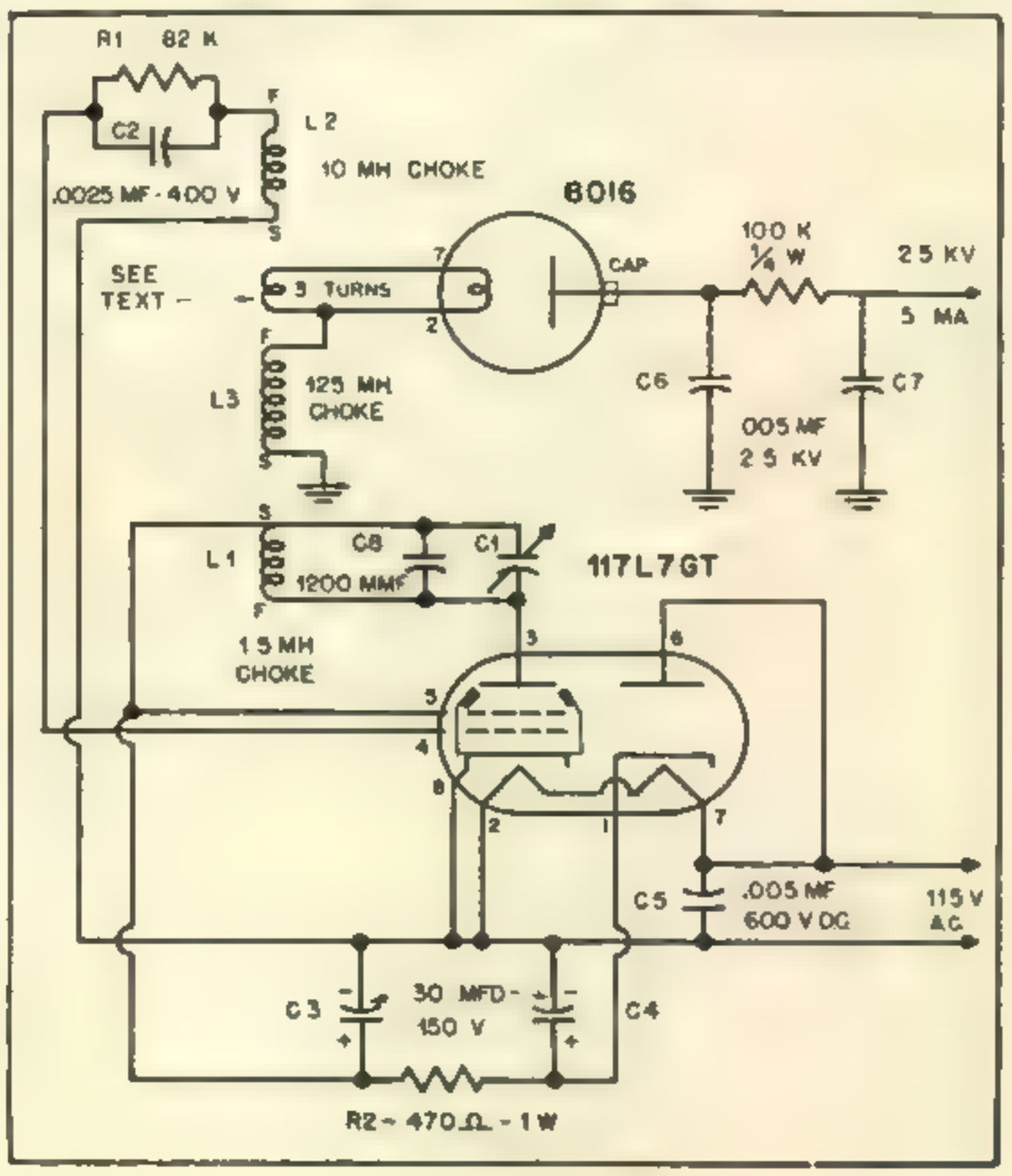


Fig. 1. Circuit diagram of the r-f power supply.

C1—HC 41
C2—.0025 μf, 400 v.
C3, C4—30 μf, 150 v., electrolytic.
C5—.005 μf, 600 v.
C6, C7—.005 μf, 2500 d.c.w.v., mica.
C8—.0012 μf, 500 d.c.w.v., mica.
L1—Bud 1.5 mh choke (iron core).
L2—Bud 10 mh choke (iron Core).
L3—Bud 125 mh choke (iron core).
R1—82K, ¼ watt.
R2—470 ohms, 1 watt.
R3—100K, ¼ watt.

*4702 Nicholas Ave., S.W., Washington, D. C.

times the required current. This "high energy" type of supply can easily become a safety hazard. Radio frequency supplies for the operation of cathode ray tubes eliminate these objectionable features.

Since the idea of this type of supply is new to many experimenters, a brief discussion of a few facts will help the reader better understand their operation.

With an increase in operating frequency, a reduction in inductance over that needed for 60-cycle supplies is obtained. By designing the transformer to operate at frequencies of from 200 to 300 kc, the size of a suitable high-voltage transformer is reduced by a large percentage. Filtering for rectified radio frequency is also reduced by even a larger percentage. For example, one condenser for 30 kilovolts and with a capacity of 600 micromicrofarads is only 2 1/4" long and 1 3/8" in diameter!

Sixty-cycle transformers are usually close to unity coupling. In the case of the tuned radio frequency transformer, however, this coupling may vary from less than critical[1] to a "practical maximum" of many times critical. (Theoretically it is possible to reach unity coupling.) I-F transformers are usually coupled near the critical value. Transformers for the high-voltage supplies are usually coupled 15 to 30 times this value.

The step-up from the primary to the secondary depends upon the impedance ratio of the primary and the secondary. It is therefore a requirement that the secondary winding be of high Q and that the distributed capacity be low so that the inductance may be as large as possible. Since the circuits are resonant the impedance is a resistance and given by $R=Q\omega L$ or $R=\frac{Q}{\omega C}$ (where Q is greater than 10). It is also necessary to have a high primary Q. The reflected loads of the diode and its filter and of the plate impedance of the oscillator decrease the values of Q of the coils alone.

The use of over-coupled (greater than critical) circuits produces a double peaked curve of voltage across the secondary when the operating frequency is varied above and below the natural resonant frequency of the secondary.

[1] Critical Coupling $=\sqrt{Q_{Primary}\ Q_{Secondary}}$

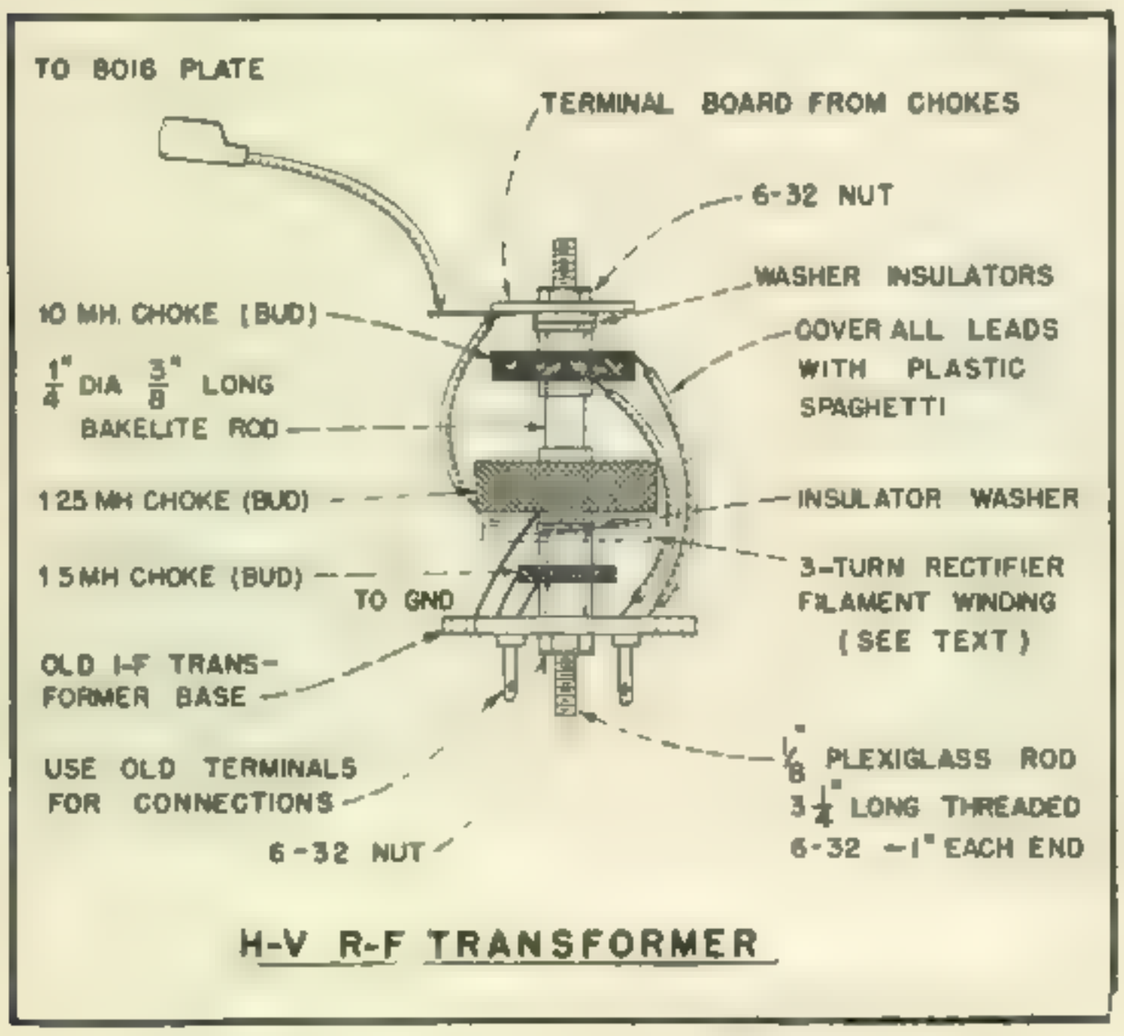


Fig. 2. Details of the h-v r-f transformer.

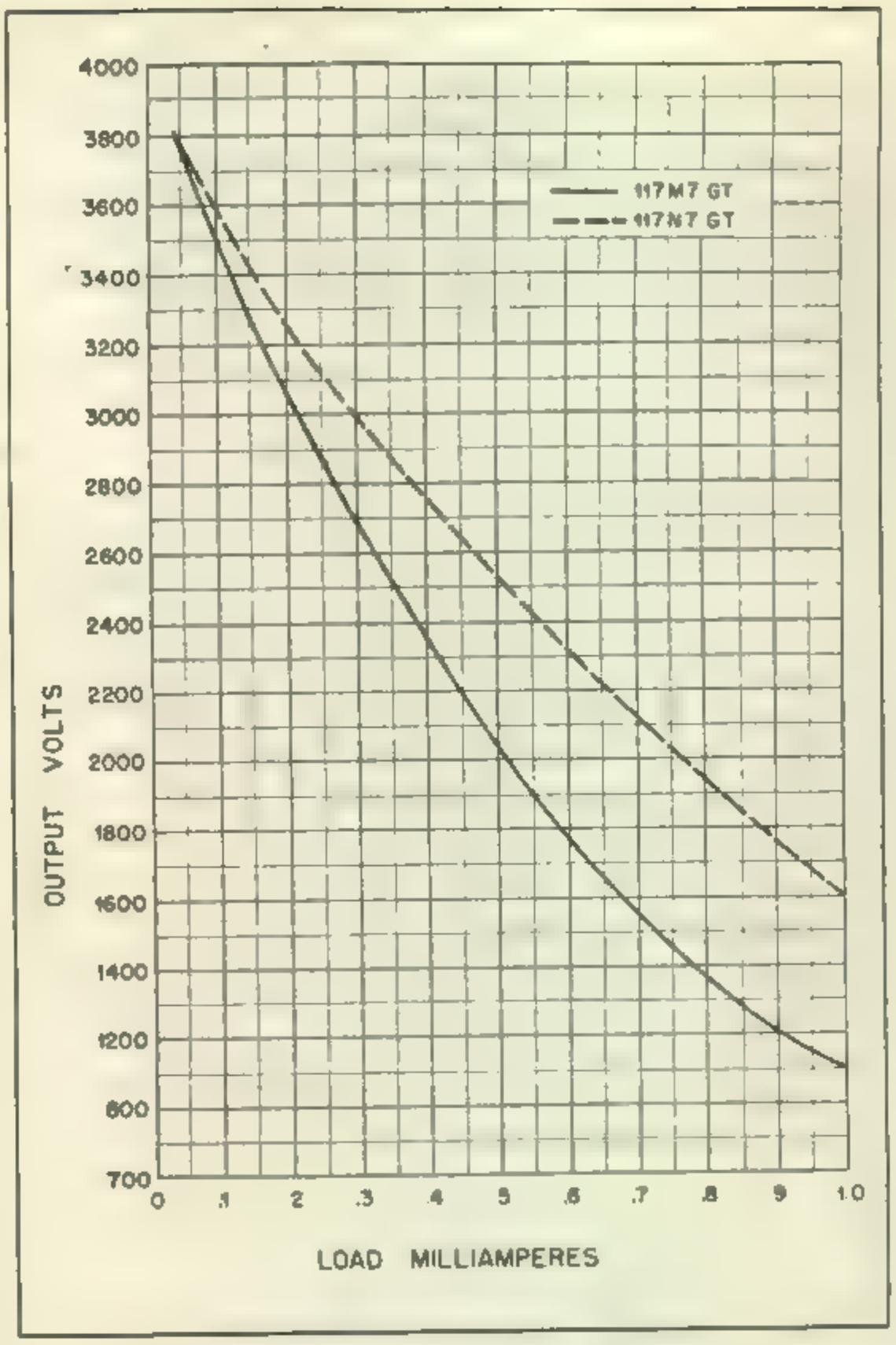


Fig. 3. Load current vs. output voltage curve.

Postscripts

Key Clicks

The identification of our August cover, depicting 1947 Field Day operation by a group of Washington (D.C.) hams in the Shenandoah National Park, contained several errors, for which we apologize. The man nearest to the camera in the picture, and operator of the 20-meter rig, is Lou DeLaFleur, W4AW, and the second man standing from the left is Pete Petersen, W3IUZ. The operators responsible for the score at W3AM/4 (which was operating as a field day station without sponsorship of the Washington Radio Club) were Ev Battey, W1UE; Warren Andrew, W3AM; Prose Walker, W3BMX; George Sterling, W3DF; Pete Petersen, W3IUZ; Ren Collins, W3KDP; Lou DeLaFleur, W4AW, and Myron Pawley, W4UQ.

Schenectady (N.Y.) Hamfest

The Schenectady Amateur Radio Assn. is planning an all-out hamfest at the Hotel Van Curler in Schenectady on October 18th. According to W2PFU hamfest chairman, big features of the event will include a grand opening of festivities by atomic energy, demonstration of latest mobile phone equipment, outstanding technical speakers and a fine selection of door prizes.

The Other Fellow's Station - W2SAI

HIGHEST AMERICAN PHONE score reported in the 13th A.R.R.L. International DX Contest is that of W2SAI. Fifth highest American score on c.w. is W2SAI. Yet the average DX man or contest operator probably never heard of W2SAI unless he participated in these events and had station after station come back to W2SAI. Who is he? Well, the F.C.C. license gives all the credit to lanky John Dawson Ransome.

Dawson isn't quite certain how it all began, but it was some time around 1935 when he started in amateur radio. Located in Riverton, New Jersey, the present QTH, John had the good fortune to have as a neighbor W3AZG. Jerry Harris helped him build the first three-tube blooper, coached him on code, and was right there when W3HNT was issued to his young protege.

The first rig consisted of a pair of 45s T.N.T., on c.w. only. By about 1939 W3HNT had advanced to a pair of TZ40s modulated by a pair of 6L6s, with an 8JK beam. 10-meter phone was the stomping ground. In 1939, a 60-foot self-supporting wooden tower was erected and a 4-element beam put on top. A new rig, using a pair of HK254s, running around 600 watts input was used until the summer of 1941.

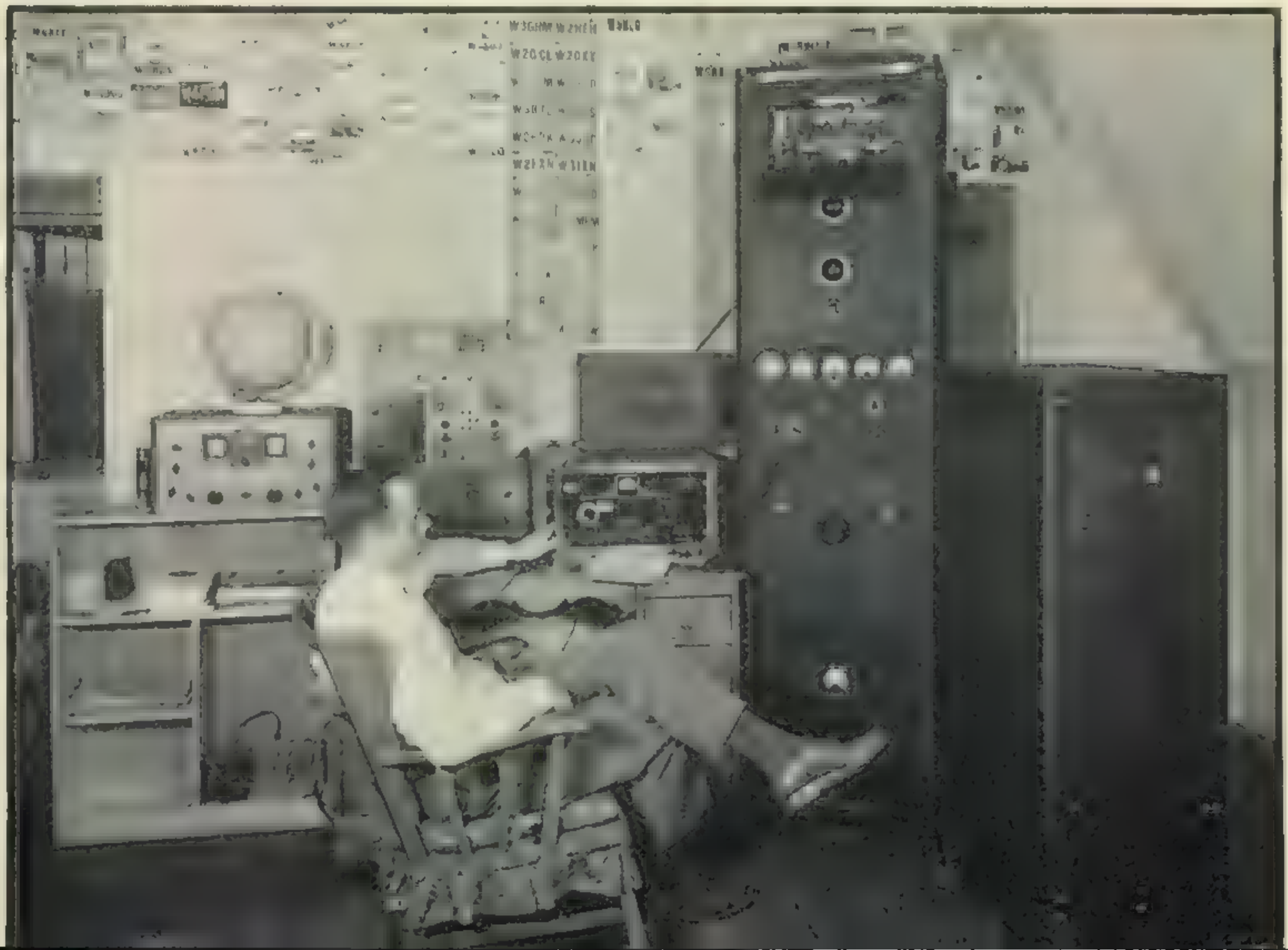
Dawson Ransome has another hobby—flying. In the summer of 1941, when the Army Air Forces was asking for experienced pilots to train aviation cadets, he left Jersey to give instruction as a civilian contract pilot. Late in 1943 he joined the AAF as a regular and was assigned to the Ferry Division of the ATC. For a short while he ferried ships to different points over the globe, ending up stationed overseas near Chabua, India, and flying the "Hump" from India to China.

Back from overseas Dawson came home to find that the 60-foot tower had blown down and the family had used the wood in the fireplace. Times had changed, so the old rig was disposed of and a BC610 picked up as a stopgap. A 75-foot steel tower went up to hold a 2-element 20-meter and a 4-element 10-meter beam.

While all this was going on the call was changed from W3HNT, during the reallocation of districts, and W2SAI was born. During this same period of rebuilding Dawson became interested in the Frankford Radio Club, of which Jerry Mathis, W3BES, is president. As W2SAI puts it, "I have always liked to work DX, but have never been contest-minded. However, one cannot be around Jerry and the Frankford Radio Club without becoming so." After putting up a few antennas for 40 and 80 Dawson decided to give the phone and c.w. DX contest a try. The results are, by now, well known.

The present rig consists of one of the new B & W v-f-o exciter units driving an 813 which in turn pushes a pair of 450THs modulated by 822s. Receivers are an RCA AR77 and an HQ129X. In addition to the two beams, half-wave doublets are used on 40 and 80, each about 65 ft. high.

Married, father of two little girls, Dawson is a limited partner at Giles and Ransome, Inc., manufacturers of construction equipment. Still flying and busy with a new home now under construction, he finds plenty of time to be active on all bands. You'll be hearing more of W2SAI in the coming months.



Zero Bias All the Way

GEORGE D. PERKINS, W11VU/6*

A complete half kw rig built around zero bias Class C tubes which incorporates a high degree of flexibility and several desirable mechanical innovations.

BECAUSE OSCILLATOR KEYING of a multistage transmitter is almost a prerequisite for break-in operation this normally means that protective bias supplies for the doubler and amplifier stages must be included among the power packs for the transmitter. By taking advantage of some of the newer tubes and components now available, elimination of such bias supplies has been accomplished in the transmitter to be described. Further simplification has resulted in a highly efficient, compact rig at a cost of less than 20 cents per watt.

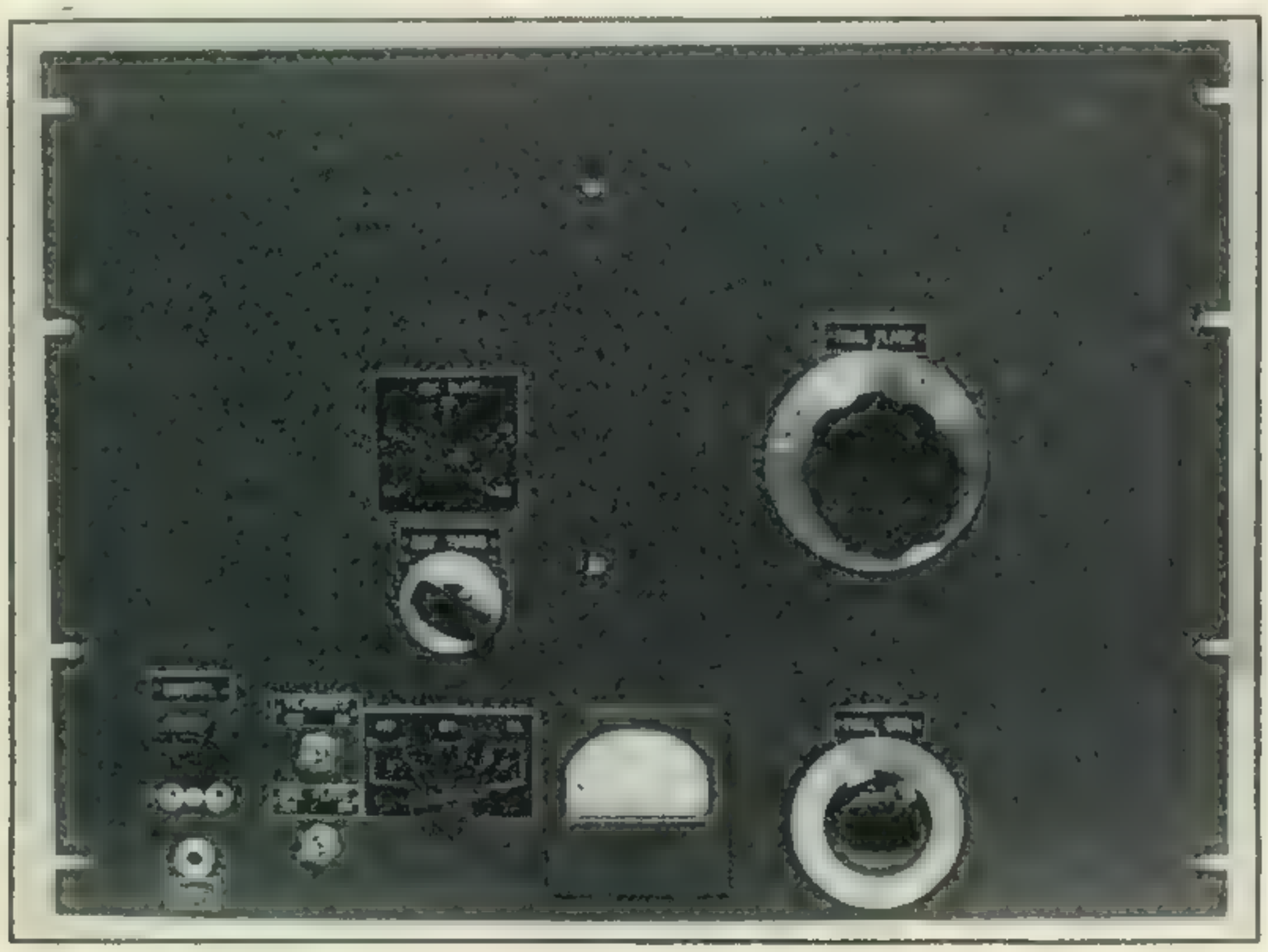
The Hytron 5514 high-mu triode is capable of handling 1250 plate volts at zero bias without exceeding the plate dissipation rating when excitation is removed. Driving power required for the tube is comparatively modest, and the tube has a high power gain. When the 5514 is combined with the CX series Barker & Williamson condensor, it is possible to build an extremely compact high-power transmitter. For example: this transmitter, consisting of a 2E25 oscillator, 5514 driver, and push-pull 5514 final amplifier, all on one chassis, is capable of handling plate power inputs up to 525 watts c.w. 435 watts phone.

Elimination of bias supplies is a big step toward simplification of a high-power transmitter, but it is logical to continue ever further. The 5514 offers another characteristic which proves very valuable. It is capable of operation at relatively low plate voltage and high current, thus making it ideal for operation into a low-impedance load. The grid circuit of the 5514 operates also at low voltage and high current and we, therefore, have conditions which make possible practically a perfect impedance match between two stages employing 5514s. One tuned circuit (in the grid of the final stage) thus takes the place of the two normally used with link coupling. Because of the heavy driver plate loading always presented by the following grid circuit, it was almost impossible to make the driver stage oscillate by itself.

The 2E25 beam pentode used as the crystal oscillator prefers a higher impedance than that offered by the following grid circuit, but as the 2E25 easily develops high voltages across its plate tank, it becomes simple to capacity couple it to the driver grid by using the coupling capacitance to divide the driving voltage to that value desired for the 5514 grid. Thus, again, only one tuned circuit is needed between these two stages. Including the tuned circuit in the final push-pull plate tank, the total is only three.

Some compromises are unavoidable in such a compact layout, but they are minor in character. Inasmuch as the driver stage is to be used as a doubler, as well as a straight amplifier, it is necessary to provide a rather high operating bias for best doubler results. This is accomplished by using a grid resistor of greater value than is required for straight-through amplification. In the completed transmitter, this same large grid leak was found to give plenty of drive both for straight-through operation on 80 meters and for doubling to drive the final on 10 meters.

*1165 E. Green St., Pasadena, Calif.



Efficient layout dictated placement of components, but the lack of symmetry does not detract from the appearance.

In keeping with the idea of simplicity, a pentode oscillator was employed to eliminate the extra tuned circuit of the Tri-tet. Crystal prices and availability justify their use. Of course, care must be taken to isolate the crystal stage from the high r-f power of the final amplifier, and this has been done by a baffle shield plate. To keep all leads short and to shield succeeding tuned circuits, the driver tube is mounted in an inverted position projecting down through the chassis.

A "Band Hopper" is used in the crystal stage, because it is just a little larger than any plug-in coil arrangement that could be used. The other two tuned circuits use plug-in coils. On 80 meters a vacuum condenser is added across the plate tuning condenser to give sufficient capacity. A single main tuning condenser with larger capacitance might have been used, but its high minimum value would have resulted in a poor L/C ratio on 10 meters where it is desirable to keep all possible losses to a minimum.

The two power supplies required should deliver 400 to 450 volts at 250 ma for the crystal oscillator and driver stages, and 400 to 1500 volts at 350 ma for the final amplifier. Since the 5514 has an extremely low internal tube drop, the final amplifier will operate efficiently at any voltage within that

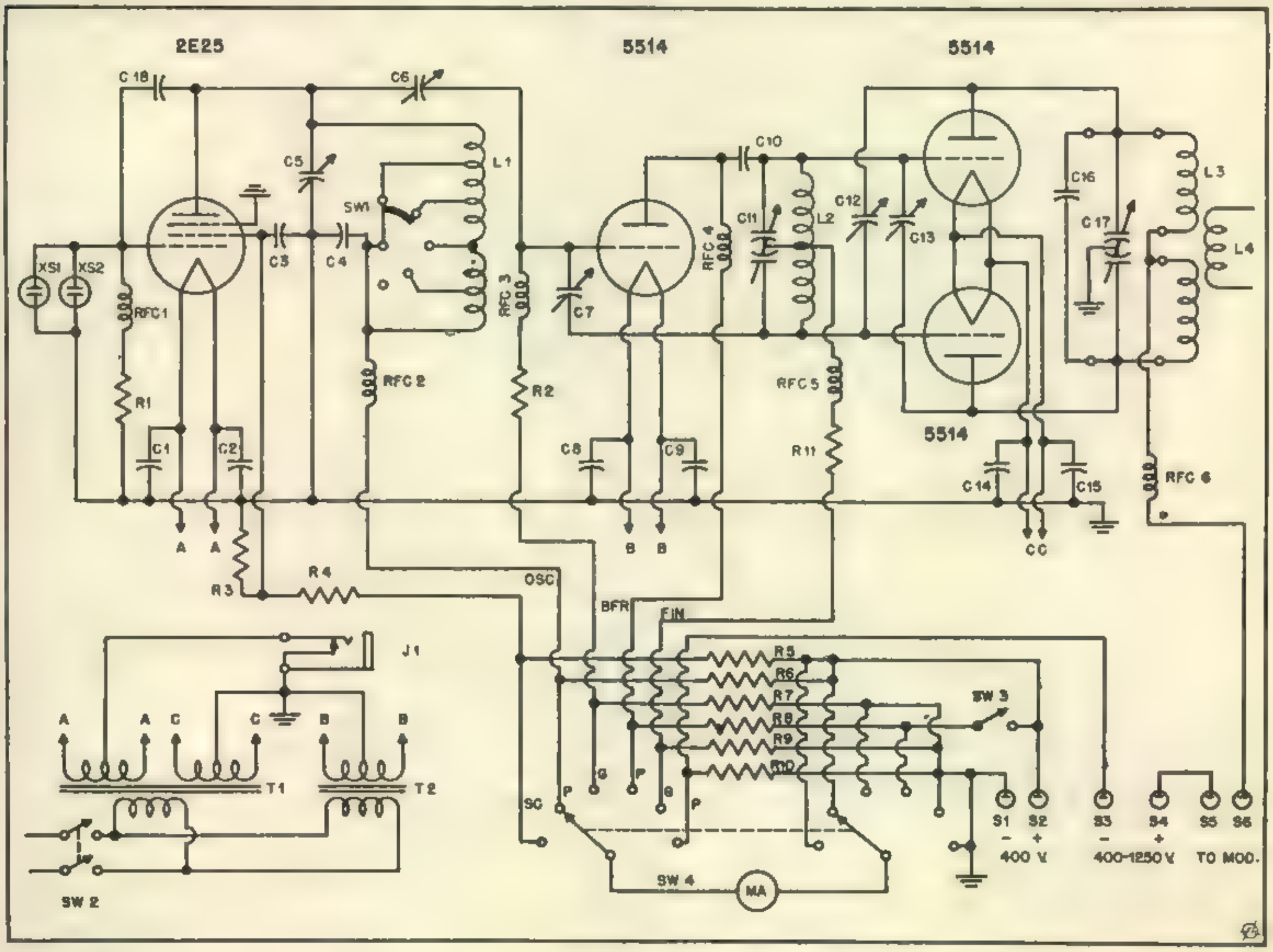
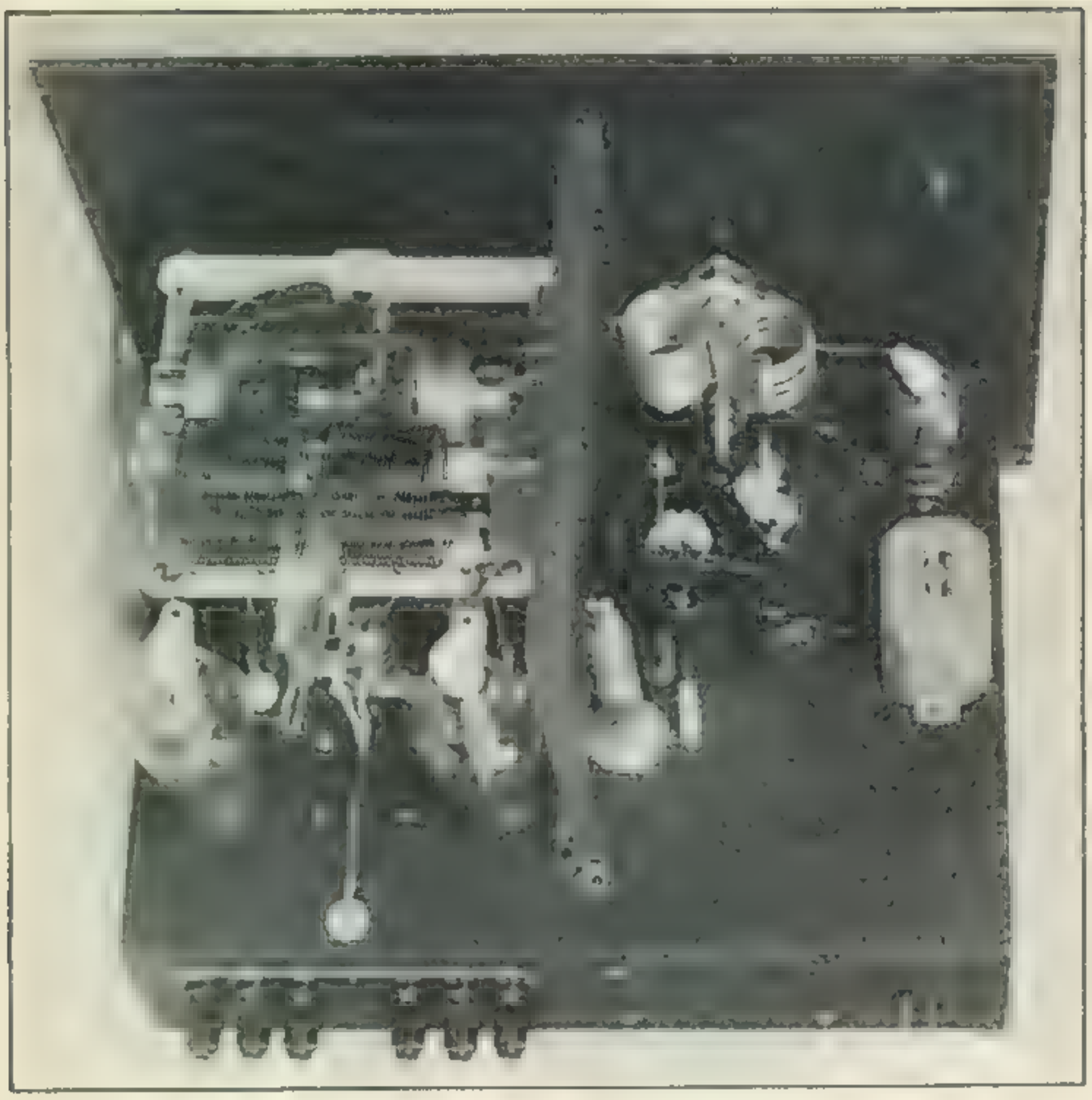


Fig. 1. Zero bias rig circuit.

C1, C2, C3—.01 μf, paper
C4, C8, C9, C10, C14, C15—.001 μf, mica
C5—50 μμf, Millen 19050
C6—18μμf, National STN 18
C7—0.5 to 13.5 μμf, Millen 15002
C11—Dual 55 μμf, Millen 12050
C12, C13—B&w CX condenser self-contained neutralizing plates N4
C16—12 μμf vacuum, Eimac VC12
C17—Dual 45 μμf, B & W CX45CN4
C18—See text
L1—B & W 2A Band Hopper
L2—B & W JVL plug in coil series
L3—B & W TVL plug in coil series
L4—B & W TVL swinging link assembly
MA—0-500 milliameter
R1—100,000 ohms, 1 watt
R2—1500 ohms, 25 watts
R3—50,000 ohms, 10 watts
R4—15,000 ohms, 10 watts
R5—100 ohms, ½ watt
R6—50 ohms, 1 watt
R7, R9, R10—10 ohms, 1 watt
R8—5 ohms, 1 watt
R11—700 ohms, 25 watts
RFC1, RFC2, RFC3, RFC5—1 mh, Millen 34108
RFC4—2.5 mh, Millen 34103
RFC5—1 mh, National 154U
S1, S2, S3, S4, S5, S6—Safety connectors, Millen 37001
SW1—Band Hopper selector switch
SW2—DPDT filament power switch
SW3—SPST buffer plate power switch
SW4—6-position 2-gang meter switch, Centralab 1411
T1—6.3v @ 3 amp., 7.5 v. @ 6.5 amp., UTC S-69
T2—7.5 v. @ 3 amp., UTC S-56
XS1—Crystal socket, Millen 33002
XS2—Crystal socket, Millen 33102



Placement of major components on top of chassis are clearly visible. 5514 buffer is in inverted position.

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range. If the final plate supply has a potential greater than 1250 volts when the key is up, a fixed bias of from three to five volts (easily obtainable from a C-battery) is ample for tube protection. With the key up, plate current at 400 volts will be approximately 25 ma, and at 1250 volts, approximately 85 ma.

Constructional Details

In building this transmitter, it is best to follow as closely as practicable the layout shown. Compactness is thus achieved while leaving all parts accessible for quick servicing or adjustment.

The crystal oscillator is placed at the left corner of the chassis and the final tubes at the rear and opposite corner immediately behind the tank condenser. The 5514 driver is mounted in an inverted position in an aluminum shield can 3" in diameter and 3½" deep. This shield can must have air holes drilled in what will be its top face to permit cooling of the tube. The can should also be painted black to assist in the heat radiation. The hole through the chassis for the driver tube should be a full three inches to insure plenty of air circulation at all times. The variable coupling condenser between the oscillator and driver stages is mounted on a ceramic standoff insulator fastened to the chassis near the shield can.

Shielding within the 2E25 oscillator tube produces such a low plate-to-grid capacitance that it is necessary to provide an external feedback capacitance to secure reliable oscillation. This feedback condenser is made of two pieces of insulated wire twisted together for a length of about two inches. The length may be determined experimentally by operating the oscillator loaded by the driver grid circuit, and twisting enough wire to insure that the crystal will follow keying. A small polystyrene feed-through is used to bring a lead from the plate circuit through the chassis. The twisted wires forming the feedback condenser are then connected —one to the bushing lead and the other to the grid prong on the socket.

The crystal sockets are placed on the front panel for easy accessibility. Two different types of sockets are used to accomodate the two kinds of pin spacing, found in general use. Filament and driver plate power switches are placed near the crystal sockets. Going from left to right the meter switch is next in line. The meter itself is mounted underneath the chassis and so that it lines up on center of the panel. It is mounted in this location to protect it from the strong r-f field of the final amplifier. Meter shunting resistors are mounted directly on the two-gang meter selector switch. They are very small values because the meter has a resistance of less than half an ohm, thus permitting the passage of more than 90% of the current through the meter even when the shunting resistor is as low as five ohms

Also positioned below the chassis deck is the final grid condenser. This condenser is operated by an insulated coupling shaft, so that it may be placed back far enough to keep the grid leads to the final tubes as short as practical. The socket for the grid coil is mounted on ¾" brass bushings directly behind the condenser. The 4" chassis is deep enough for clearance when the coil is plugged into position.

Neutralizing condensers for the final amplifier are already built into the final tuning condenser, and the grid leads from them are brought down through the chassis by means of ceramic feed-through insulators. When mounting the final tubes, care should be taken that they are placed to permit ready access to the neutralizing condensers with an insulated screwdriver. The driver neutralizing condenser is mounted close to the supporting aluminum shield can. The baffle shield has a cutout to permit the wire to pass through to the proper feed-through insulator. Because grid wires for neutralizing the final amplifier are crossed over below the chassis, it is possible to directly connect the driver neutralizer to the feed-through insulator nearest it. Examination of the circuit diagram will show this.

The filament transformer for the driver tube is mounted on top of the chassis, with connecting wires for the driver filament running along the top of the chassis and up the side of the shield can. A hole is cut in the chassis below this transformer for the 115-volt supply line and for the filament center-

tap wire to ground. The other filament transformer is mounted below the chassis with its base fastened to the rear of the chassis. Filament leads for the 2E25 are made of number 20 wire to introduce the voltage drop necessary to bring the filament voltage down to the 6.0 volts required. This lead should be made with the assistance of an a-c voltmeter. Millen safety connectors, placed in a row behind the final amplifier and on the rear face of the chassis, are utilized for power supply and modulator leads. The final plate voltage lead goes through the chassis by means of a ceramic feed-through. The same method is used for supplying the plate potential to the crystal oscillator.

The final tank is mounted on brackets fastened directly to the stator supporting bolts of the condenser, and the brackets are made so that they also hold the clips for the vacuum condenser. This type of construction reduced lead inductances to minute values; as a result no high-frequency parasitic oscillations were encountered. Use of a 2.5-mh choke in the plate circuit of the driver stage eliminated any tendency toward low-frequency parasitic oscillations. It might be well to point out that the condenser shaft is $\frac{3}{8}$" and requires a large knob.

The baffle shield is quite necessary, because it avoids the oscillations which might take place in the two unbiased stages when excitation is removed. Neither stage oscillates by itself when properly neutralized, but the two interacting might "take off." Bakelite plates can be engraved for naming all controls and switch positions, or a Millen decalcomania transfer set can be utilized with good results.

Tuning Up

To place the transmitter in operation, light the filaments and measure filament voltage. plug in the required crystal for the frequency to be used, set the band switch at the proper point, and apply plate voltage to the first stage only, by leaving the driver plate power switch in the "OFF" position. The meter switch can be set to read either oscillator plate current or driver grid current. If the oscillator plate current is being read, the value will drop to 40-50 ma when the stage is resonated. If the grid current is being metered, it will be found to rise from 0 to 50-60 ma.

The final grid condenser is then slowly rotated to check neutralization. Neutralization of the driver stage is not at all critical. Best results were obtained by switching the meter to the final grid circuit and, without plate voltage on the driver, setting the neutralizing condenser for minimum final grid current. The process should be repeated until the smallest possible reading is observed on the meter.

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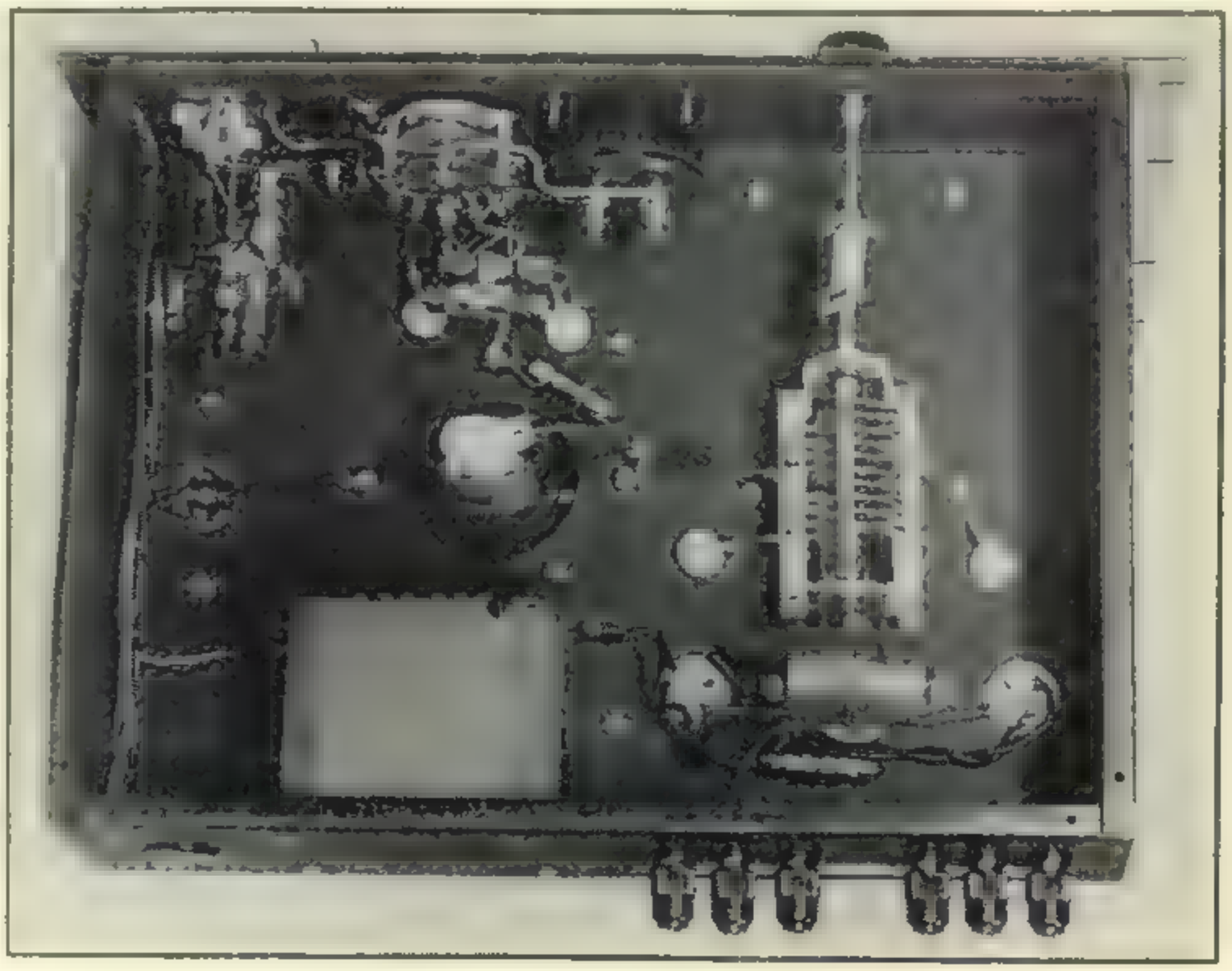
Next, plate voltage should be applied to the driver stage, and the final amplifier checked for neutralization. This part of the tuning-up is the most critical and must be carried out with extreme care. As a final check of the adjustment, it is wise to turn off the excitation and apply between 500 and 1000 volts to the final stage to check for self-oscillation. If there is any indication whatsoever of oscillation, it must be eliminated. If this oscillation persists regardless of the setting of the neutralizing condensers, it is most likely the result of parasitic oscillations. Parasitic suppressors in the plate and/or grid leads will probably eliminate them. If the mechanical and electrical layout has been followed carefully, however, it is unlikely that this difficulty will be encountered.

Should key clicks be encountered, the conditions causing them would vary so much in different installations that consultation of the Handbook is the best advice that can be given here.

During operation of the transmitter, as has been mentioned before, the plate current of the unbiased stages *will not* drop to zero when the key is up. This is perfectly normal and has the advantage of improving power supply regulation and minimizing key thumps. When the transmitter is operaing properly and feeding into an antenna, the following approximate values of currents will be obtained: oscillator screen, 10 ma; oscillator plate, 50 ma; driver grid, 40 ma; driver plate,120 ma; final grid, 120 ma; final plate, 300 to 350 ma. When the driver is used as a doubler, plate current will rise to around 160 ma. It is a wise precaution to check all filament voltages directly at the socket when the transmitter is operating at full load. Make sure they are within the manufacturer's ratings for the tubes. This is insurance against shortened tube life.

Provision has also been made for the use of a v.f.o. with this transmitter. The output of the v.f.o. is connected to one of the crystal sockets, and a plug connected to a 400-ohm resistor bypassed by a .01-μf condenser inserted in place of the present keying lead plug.



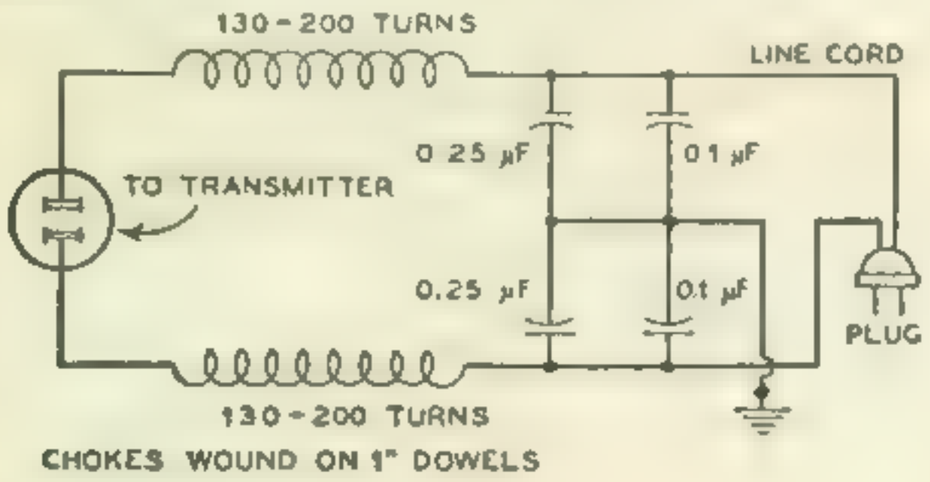
By duplicating the layout illustrated all parts and wiring can be comfortably fitted under one chassis.

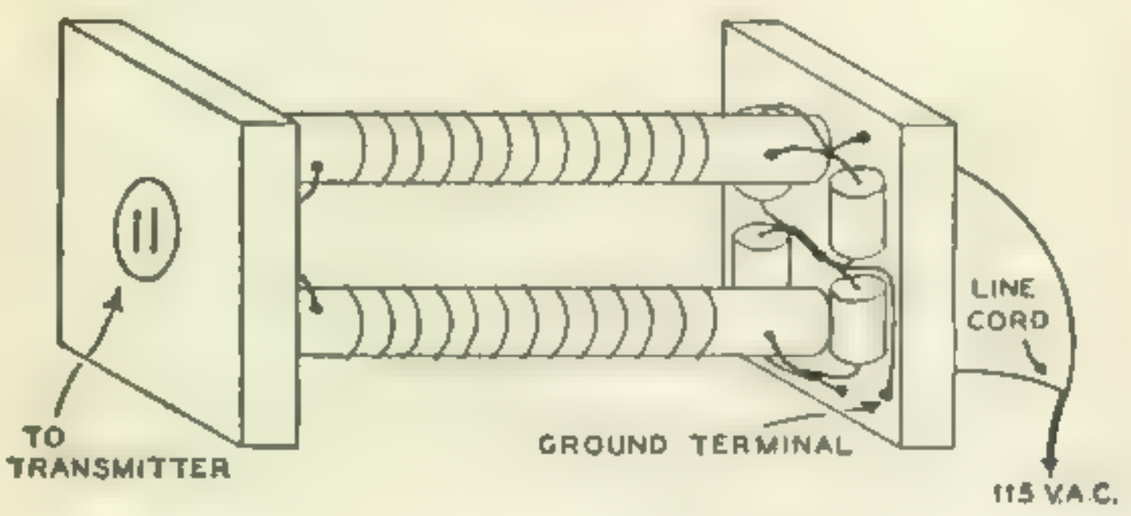
Inside the SHACK AND WORKSHOP

Conducted by A. DAVID MIDDLETON, W1CA*

R-F Filter for 115-Volt Line

This is a reliable line filter widely used a few years ago but probably forgotten by many of the gang. I recently built up one of these units, shown in *A* of the circuit, when I discovered that r.f. was leaking back into the power line and causing BCI in an apartment downstairs. (The apartments are on separate meters but have a common a-c lead-in from the street.)





I wound 133 turns of No. 16 enameled, double-cotton-covered wire on 15/16th inch broom sticks. (More turns might be even better.) Then I tried various condensers until the r-f feed-back was reduced to a minimum. (Different values of condensers should be tried for each installation.)

After winding the chokes, I fastened a block of wood on the ends (as shown in *B*) and placed the a-c socket on one end plate, and the condensers and ground terminal on the other. I drilled a hole thru the block with the condensers and ran the a-c line cord thru this block. (See *B* above).

Maybe this will help put the r.f. into your antenna and keep it out of your neighbor's BCL set. It did the job at W9BAY.

Ray Stegemiller, W9BA Y

Changing the Frequency of a "Plated" Crystal

There are many crystals in use today which have plated electrodes. These electrodes are evaporated on the crystal under vacuum and are usually of gold. It is sometimes desirable to change the frequency of one of these crystals but the usual method of grinding is not possible because the plates cannot be removed and then replaced.

It is impossible to *raise* the frequency of these crystals and retain the electrodes but the frequency can be *lowered* by increasing the thickness of the electrodes. The electrodes may be built up by plating copper on the gold. This can be done easily by placing the crystal in a weak solution of copper sulphate and running a d-c current (at about four volts) thru the solution with the plates of the crystal as the *cathode* (—) and a copper wire for the *anode* (+). This will *lower* the frequency about 10 kc in 15 seconds. If the process is carried too far the excess copper may be removed by reversing the current. Simply dipping the crystal in this solution will raise the frequency about 1 kc.

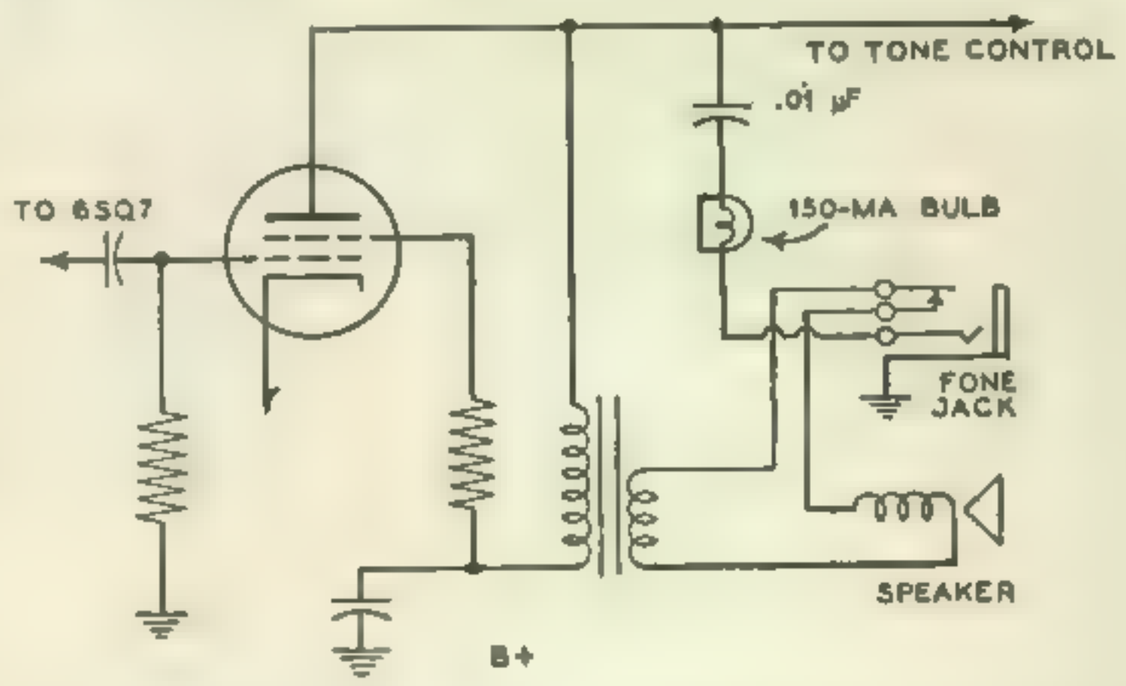
The crystal plating and soldered leads may be dissolved in a solution of HCL and HNO. A few drops of hydrofluoric acid will increase the speed of the reaction. The crystal must be placed between conventional electrodes after the plated electrodes have been removed and this will *raise* the frequency of a 7-mc crystal about 100 kc.

The frequency of an *unplated* crystal may be raised by an etching process which consists of placing the crystal in a solution of hydrofluoric acid or ammonium bifluoride until the desired frequency is reached. The speed of the etching process may be increased by heating the solution. But remember that hydrofluoric acid is the *most corrosive acid* commonly used. Handle it carefully!

E. B. McIntyre, W3KHJ

Improved Headphone Reception with the S-40 Receiver

Some of the gang may have wondered why the signals appear to be much *weaker* when headphones are used on the S-40 or S-40A receiver. This condition worried me until I took a look at the circuit diagram. The headphones are resistance-coupled to the 6SQ7 tube, and the 6F6G is by-passed completely, on 'phones.



I made the change to the circuit shown in the diagram, using a different type fone jack and a 150-ma pilot bulb as a fuse to protect the 'phones. Now, my headphones have the proper audio level.

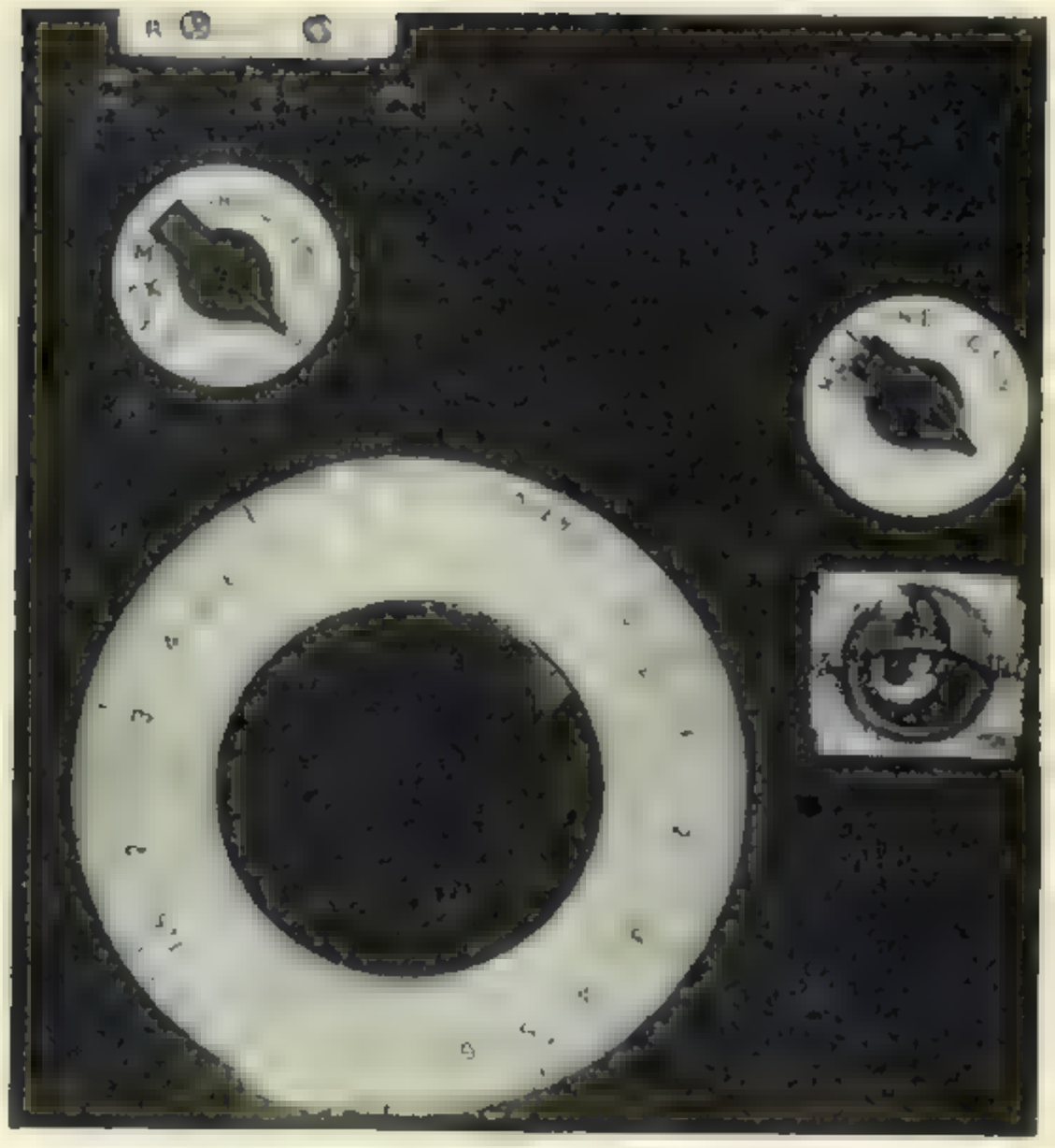
Dick Canfield, W4BXL

**Address all contributions to S & W Department, c/o CQ, 342 Madison Ave., N. Y. 17, New York.*

A Wide-Range

R and C TESTER

FRANK C. JONES, W6AJF*



Front view of condenser-resistor Wheatstone bridge

Simple Wheatstone bridge of high sensitivity using a cathode follower for coupling.

THE WHEATSTONE BRIDGE illustrated here was built by the writer in his laboratory, during the war, out of miscellaneous parts that were procurable at that time. It has proven to be an exceptionally useful piece of test equipment for measuring the unknown values of all types of resistors and condensers. Basically this tester consists of a simple bridge circuit with three *standard* condensers and three *standard* resistors, a 1000-cycle audio oscillator, a cathode follower coupling stage and a magic eye null indicator. With these selected *standards*, the bridge will accurately indicate the values of condensers ranging from one micro-microfarad to forty microfarads and resistors from one ohm to forty megohms. Maximum and minimum capacities of large and small variable condensers are easily measured by selecting the approximate condenser standard and rotating the ratio dial to the null point as indicated by the magic eye.

Certain commercial moderately priced CR bridges use a 60-cycle supply voltage for the reactance measurements. This low audio frequency, however, will limit the minimum capacitances that may be measured since the reactance of a 50-$\mu\mu$f condenser, for example, is about 50 megohms. When employing an audio supply in the neighborhood of 1000 cycles this reactance is reduced to about 3 or 4 megohms. For the 1000-cycle source in our bridge a simple Colpitts oscillator using a 6J5 triode has been devised. Although the frequency of oscillation may be anywhere from 600 to 1500 cycles, depending on the absolute condenser values used in the circuit, the only juggling of components necessary is that of *C1* and *C2*. These condensers should have a ratio with the midget loudspeaker transformer which provides a good looking sine wave when viewed on an oscilloscope.

A midget loudspeaker transformer with a low impedance output winding is used for feeding the audio voltage to the arms of the Wheatstone bridge. The low impedance winding reduces the capacity unbalance to ground to a negligible value with the bridge constants chosen.

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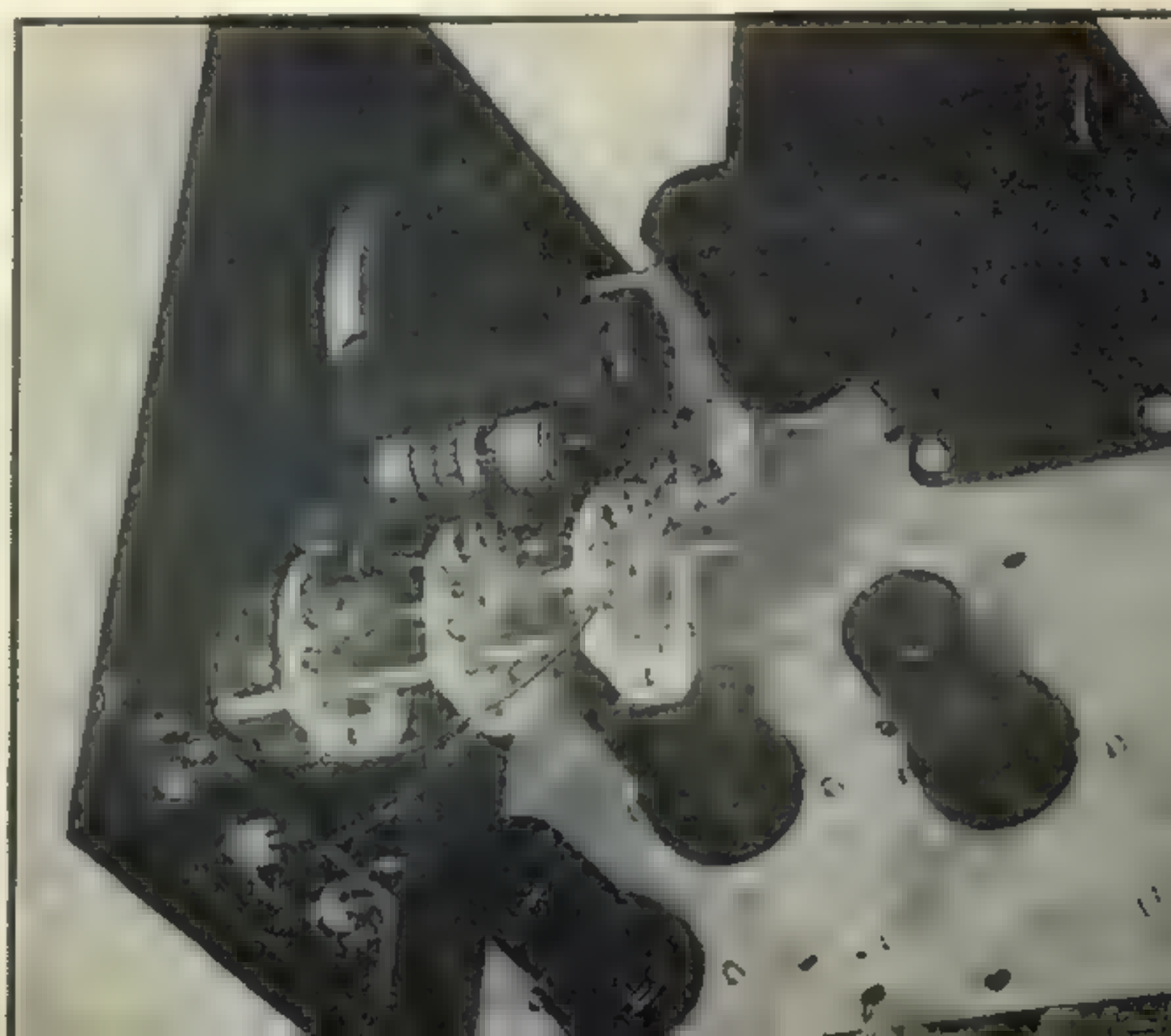


Rear view of condenser-resistor Wheatstone bridge

The three *standard* condensers and resistors are best chosen with the help of another Wheatstone bridge of fair accuracy. However, it is now possible to obtain wire-wound resistors of 1% to ½% accuracy which are suitable for the 100-ohm, 10,000-ohm and 1-megohm standards. The three condensers should be within 1% of the indicated values. The 0.0001-μf low-range *standard* should be about 1% low in value to compensate for the capacity between the sections of the ceramic switch. The 10-ohm and the 40-ohm resistors in series with the ends of the 2000-ohm ratio potentiometer are for the purpose of limiting the dial range and preventing too low a resistance load to the audio oscillator. Some experimenting with these two resistors may be necessary.

The 6E5 magic eye proves as usual, to be a very sensitive null indicator. The eye opens up fully to a sharp image only at the exact instant of balanced audio voltage. Although the input resistance of the 6E5 is relatively high the null indication can be made much more effective if the load on the bridge is made as high as possible A cathode follower is a natural selection for this service since its input resistance and capacitance load will have a negligible effect on the bridge arms. The 10-megohm grid leak of the 6J5 cathode follower is tapped into the cathode resistor to give a reasonable amount of bias to the tube. With this connection the actual input resistance is about 10 times the actual value of the grid resistor when the cathode

(*Continued on page 84*)

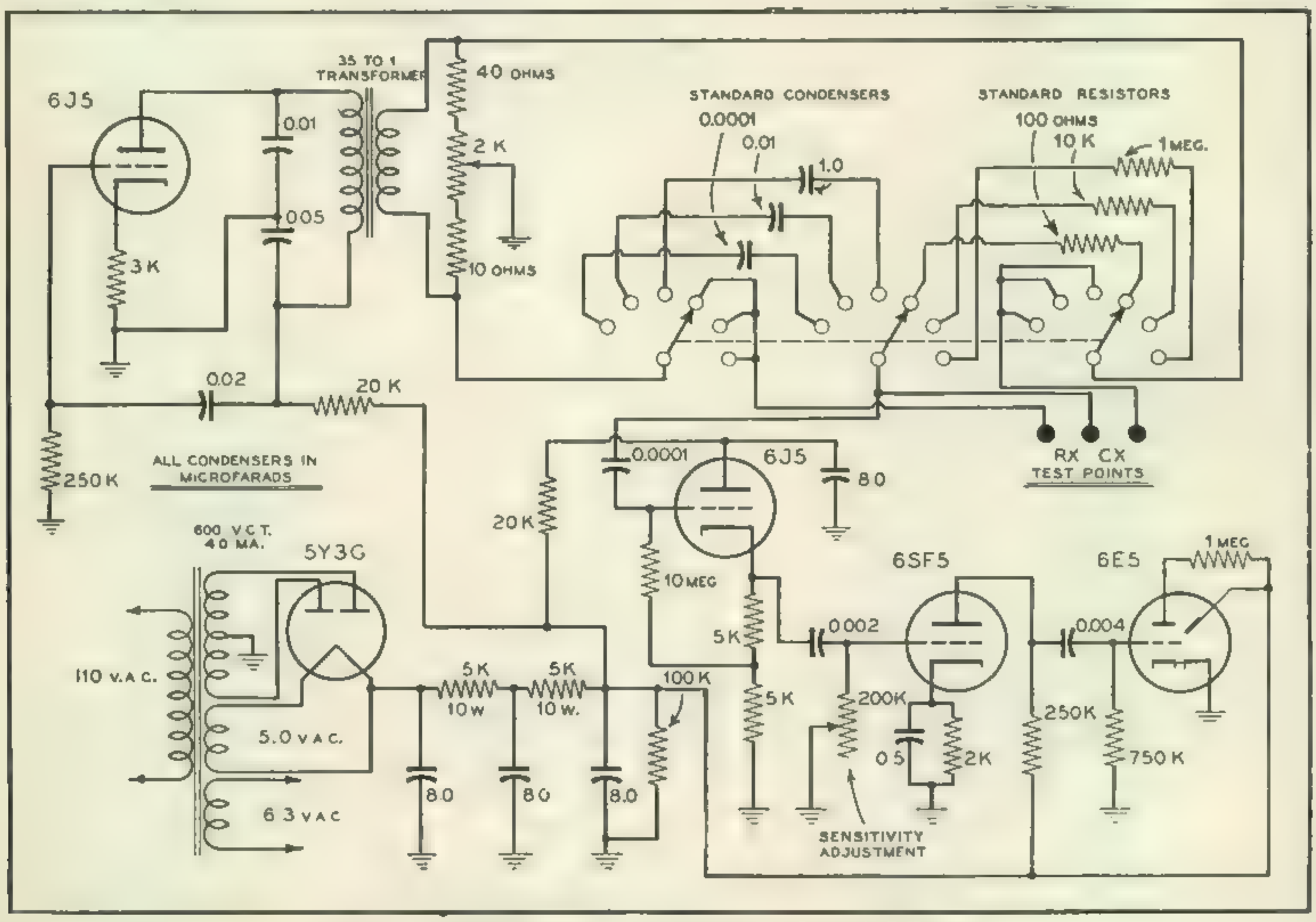


Fig. 1. Circuit diagram for wide-range R and C Tester.

C1—0.01 μf, paper.
C2—0.05 μf, paper.
C3—0.02 μf, paper.
C4—0.0001 μf, mica, very close tolerance, see text.
C5—0.01 μf, mica, very close tolerance, see text.
C6—1.0 μf, paper, very close tolerance, see text.
C7, C8, C9, C11—8.0 μf, 450 volts, electrolytic.
C10—0.0001 μf, mica.
C12—0.002 μf, mica.
C13—0.5 μf, paper.
C14—0.004 μf, mica.
R1, R14—250,000 ohms, ¼ watt.
R2—3000 ohms, 1 watt.
R3—10 ohms, 2 watts, w.w.
R4—40 ohms, 2 watts, w.w.
R5—2000 ohm w.w. pot.
R6—100 ohms, within 1% accuracy.
R7—10,000 ohms, within less than 1% accuracy.
R8—1 megohm, within less than 1% accuracy.
R9, R10—5000 ohms, 10 watts, w.w.
R11—100,000 ohms, 1 watt.
R12—10,000 ohms, ¼ watt.
R13—20,000 ohms, 1 watt.
R15, R17—5000 ohms, ½ watt.
R16—200,000-ohm pot.
R18—750,000 ohms, ¼ watt.
R19—1 megohm, ¼ watt.
T1—Midget loudspeaker transformer with 8-ohm secondary.
T2—Power transformer, 600 volts C.T., 40 ma, 6.3 volts @ 2.0 amps., 5.0 volts @ 1.2 amps.
3 gang—6 pole ceramic selector switch.

Versatile Regenerative Receiver

HARRY R. HYDER, W2LIW*

A still useful adjunct to any modern station, this simple regenerative receiver, providing continuous coverage from 3 to 20 mc, has a multiplicity of uses.

IN THE NOT-TOO-DISTANT past, all amateurs "cut their eye teeth" on a simple two-tube regenerative receiver, familiarly known as a "Det and One-Step." In these days of inexpensive superheterodynes, there would seem to be little reason for building one, and the regenerative set has practically disappeared from the amateur scene. Indeed, a large number of today's active hams have never operated one! While no one could complain of the sensitivity of the regenerator, which was limited only by the noise level, its lack of strong-signal selectivity and need for critical adjustment for best results caused it to be discarded when manufacturers brought out low-priced superheterodynes.

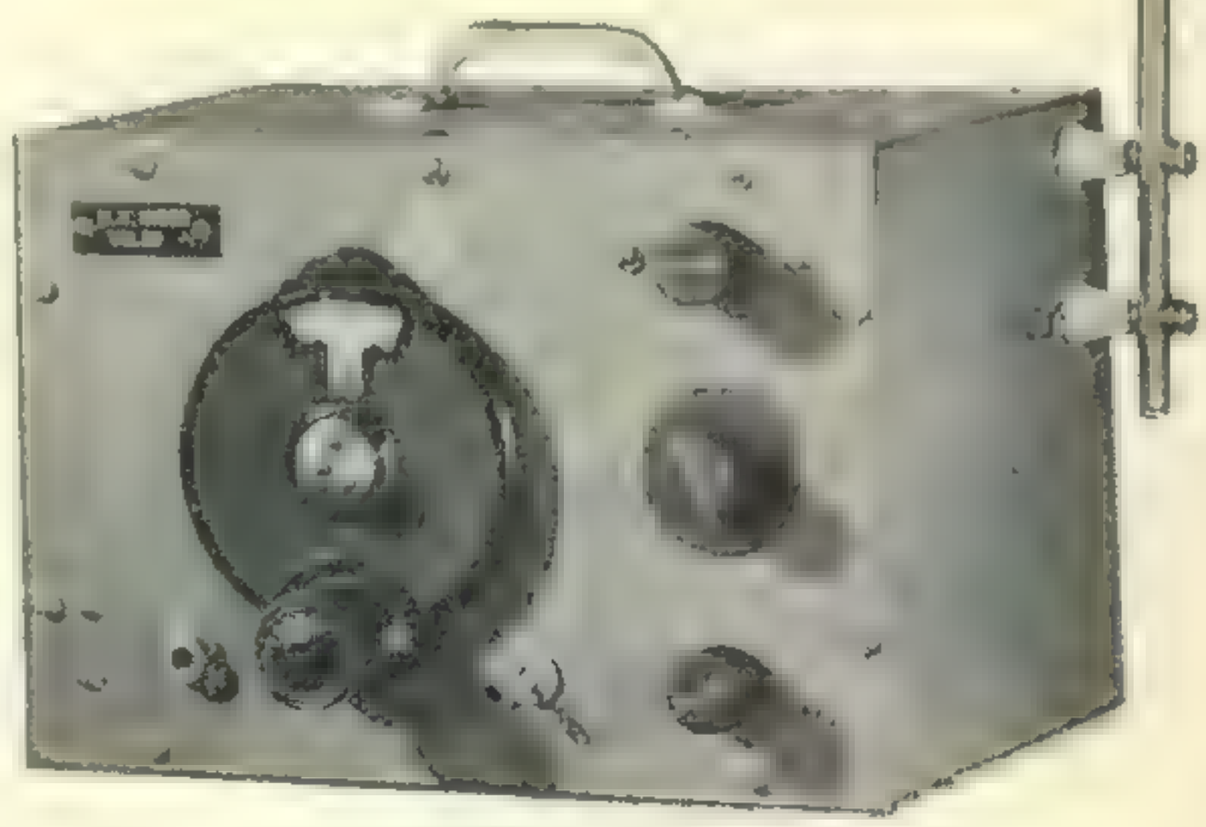
In spite of these disadvantages, the author thinks that a unit similar to the one described here is worthy of a place on any operating table. For a few dollars and a couple of hours construction time, we get:

1. A self-powered portable-emergency receiver, ready to go at an instant's notice. This set was used for c-w work by the Sunrise Radio Club of Long Island in a recent field day. In the country, away from strong local signals, it gave superlative results; being the equal in sensitivity to much more complex receivers.
2. A c-w monitor—and, to judge by the quality of some of the signals on today's bands, a large number of hams certainly need one.
3. A 20, 40, and 80-meter preselector.
4. A simple signal generator and calibrator.

The Basic Components

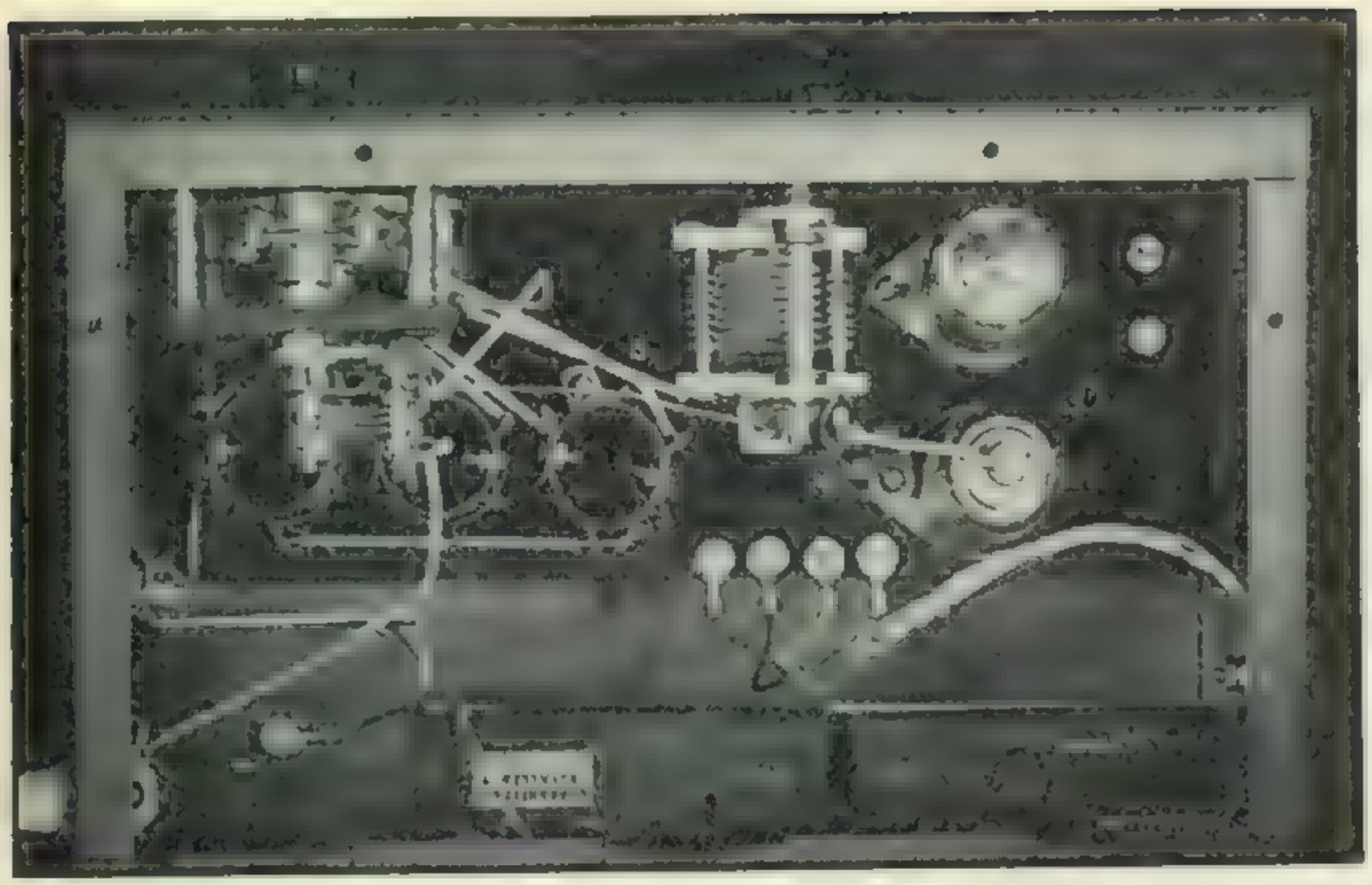
Two low-drain battery tubes are used: a 1N5GT pentode as detector, with screen-voltage control of regeneration, and a 1½-volt "A" battery, two small 45-volt "B" batteries, a telescoping rod antenna, and a pair of headphones complete the setup. The set is contained in a 7" x 7" x 10" hinged-lid metal cabinet. The batteries are held to the back of the cabinet by a metal strip running the length of the cabinet. Since no internal shielding is required, the parts are assembled on a 4" x 9" piece of bakelite, since it is easier to work than metal. All grounds are brought to one point on the front panel. This should be a good electrical joint. The upper control on the panel is the antenna coupling condenser, which is mounted behind the panel about 1" on a strip of bakelite, and provided with an insulated coupling, since it is above ground. The center control is the bandswitch, and the lower one the regeneration control. Also on the front panel are the phone jack, the ON-OFF switch, and the main tuning dial.

Since the set was designed for possible emergency use, it was decided to make the tuning general-coverage over the entire short-wave range. While no special band-spread on the amateur bands is provided, the National Type B dial shown has a 20:1 reduction drive, and fine tuning is easy. In addition, the antenna coupling condenser may be used as a vernier tuning adjustment. The three coils, which are more fully described in the coil table, are mounted to the sub-chassis with small angle brackets. The highest-frequency coil is mounted on the extreme end of the chassis, as this permits shortest leads to the coil switch. The band-switch is the type which short-circuits unused sections to ground. This is necessary, as it prevents unused coils from resonating on the next higher band, causing dead spots. All wiring should be as short and direct as possible. With the exception of the coil-switch wiring, most wiring is under the sub-chassis. The four binding posts at the rear are for battery connections. A resistor in series with the negative "B" return supplies grid bias for the 3Q5GT. The headphone jack is insulated from the chassis and is wired to short the plate of the 3Q5GT to B+ should the phones be unplugged. This will prevent damage to the tube, as otherwise the tube will have screen voltage applied without plate voltage.



Completely self-contained, compact, and light, this regenerative receiver makes an ideal portable.

*301 E. 44th St., New York 17, N. Y.



◆ ◆

Placement of parts can be copied from this top view looking into the carrying case. The 3Q5 is mounted on the right-hand side next to the panel. C2 is in the approximate panel center, C1 is mounted in the left-hand corner.

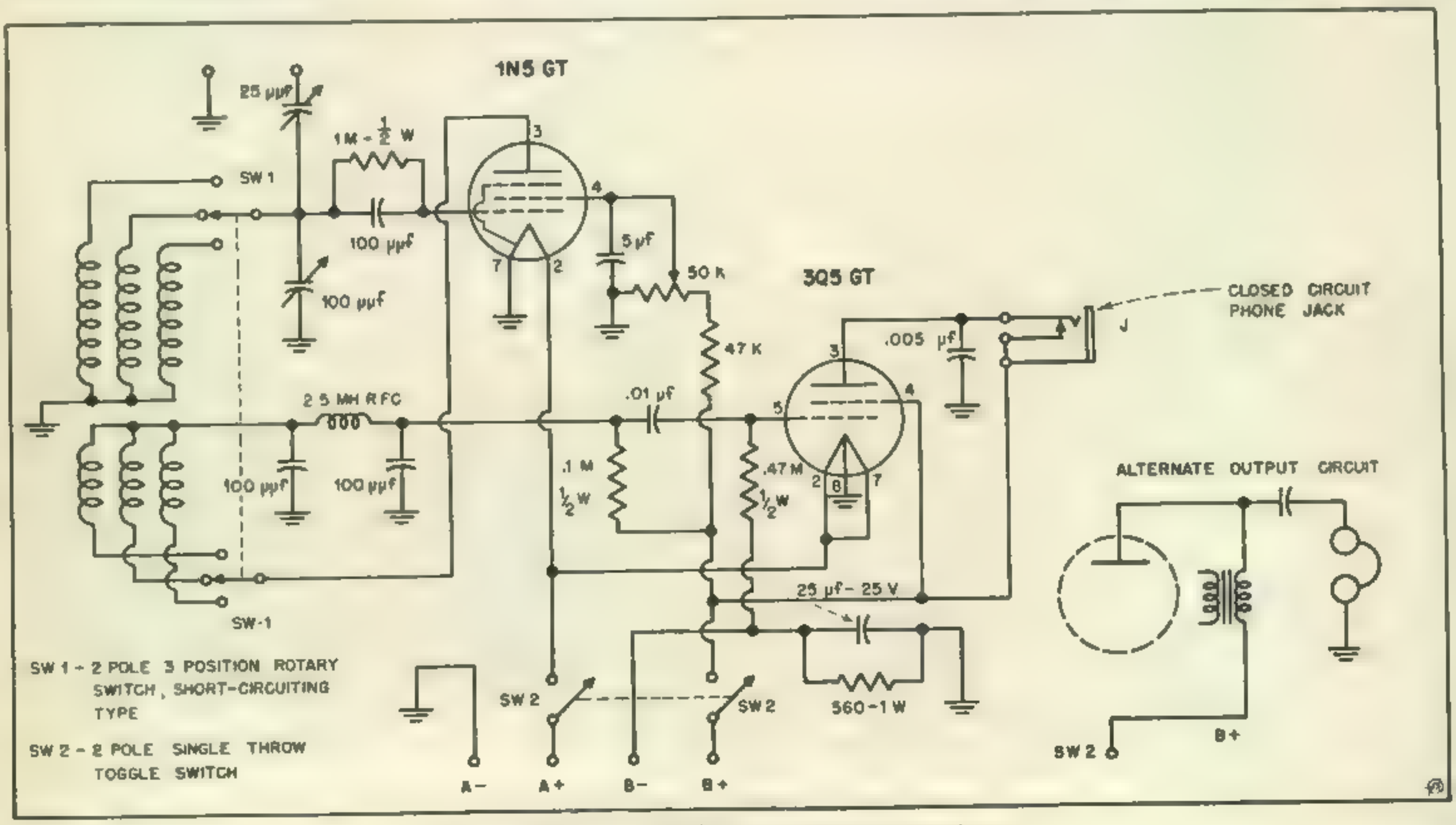
◆ ◆

In the circuit shown, high-impedance magnetic phones should be used for optimum performance. Because the d.c. for the output stage passes through the headphones, crystal types cannot be used. A preferred method of taking output from the receiver is shown in the alternate circuit, although this necessitates another part. A small audio choke is wired in series with the B + for the 3Q5GT. Headphones can then be tapped off through a .25-μf blocking condenser. It is then impossible to run the tube without plate voltage, while screen voltage is applied, and crystal phones will perform safely.

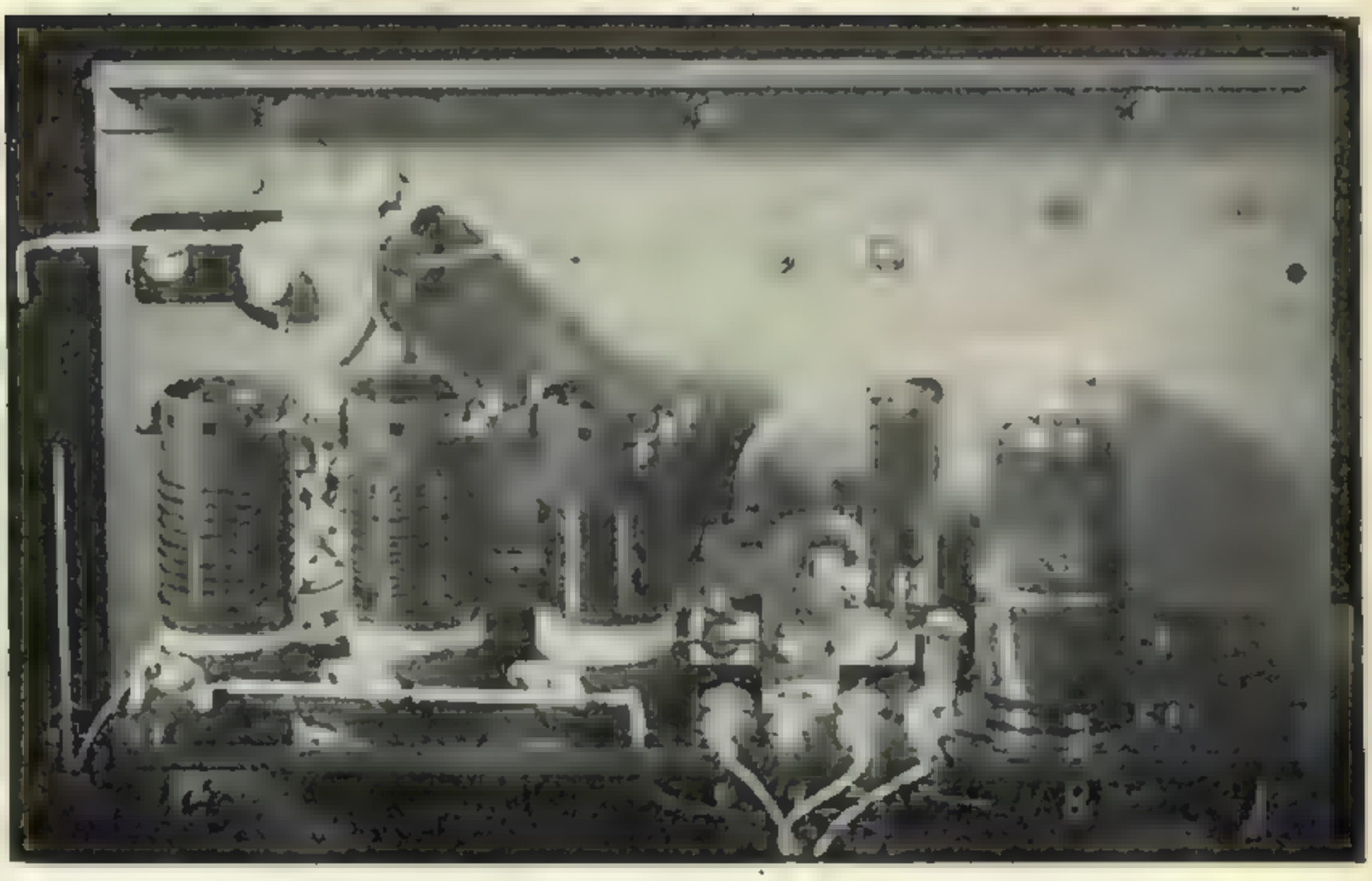
The telescoping rod antenna, originally intended for automobile use, is held to the cabinet by two feed-through insulators. The binding post near the antenna feed-throughs is for a ground connection. The set can practically be assembled and wired from the photographs.

Putting the Receiver in Operation

After construction has been completed, place it in its cabinet with the batteries (be sure you get those battery connections right!), plug in the phones, and throw the ON-OFF switch. The antenna should be extended to its full length and a *good* ground connection provided. The latter is necessary to prevent annoying hand capacity effects. The antenna condenser should be set at minimum and the regeneration control advanced until the detector oscillates, as indicated by a soft rushing sound. Tuning the main dial will produce whistles, indicating stations. If the receiver doesn't oscillate reverse the direction of the tickler winding. Reduce the regeneration slowly and readjust the tuning until the station comes in clearest. For best sensitivity, the detector should be kept just above the point of oscillation



Circuit diagram of the regenerative receiver.



Layout of major components is visible in this rear view. To permit shortest bandswitch leads the h-f coil is mounted to the left of the chassis. Wires floating at extreme left-hand side of receiver connect to antenna and ground terminals on case.

for c-w signals and just below the point of oscillation for phone signals. Increasing the antenna coupling will increase the sensitivity, but will necessitate advancing the regeneration control to maintain oscillation. A point will be reached where the detector will not oscillate at all, due to the loading effect of the antenna. Greatest sensitivity will be just below this point.

If it is desired to use a long outdoor antenna for increased pickup, the antenna capacity will probably be too great even at minimum setting. A "gimmick," made by twisting two pieces of insulated wires together two or three times, can be used to couple an antenna to the set in this eventuality. In any event, more coupling capacity will be used at low frequencies than at high.

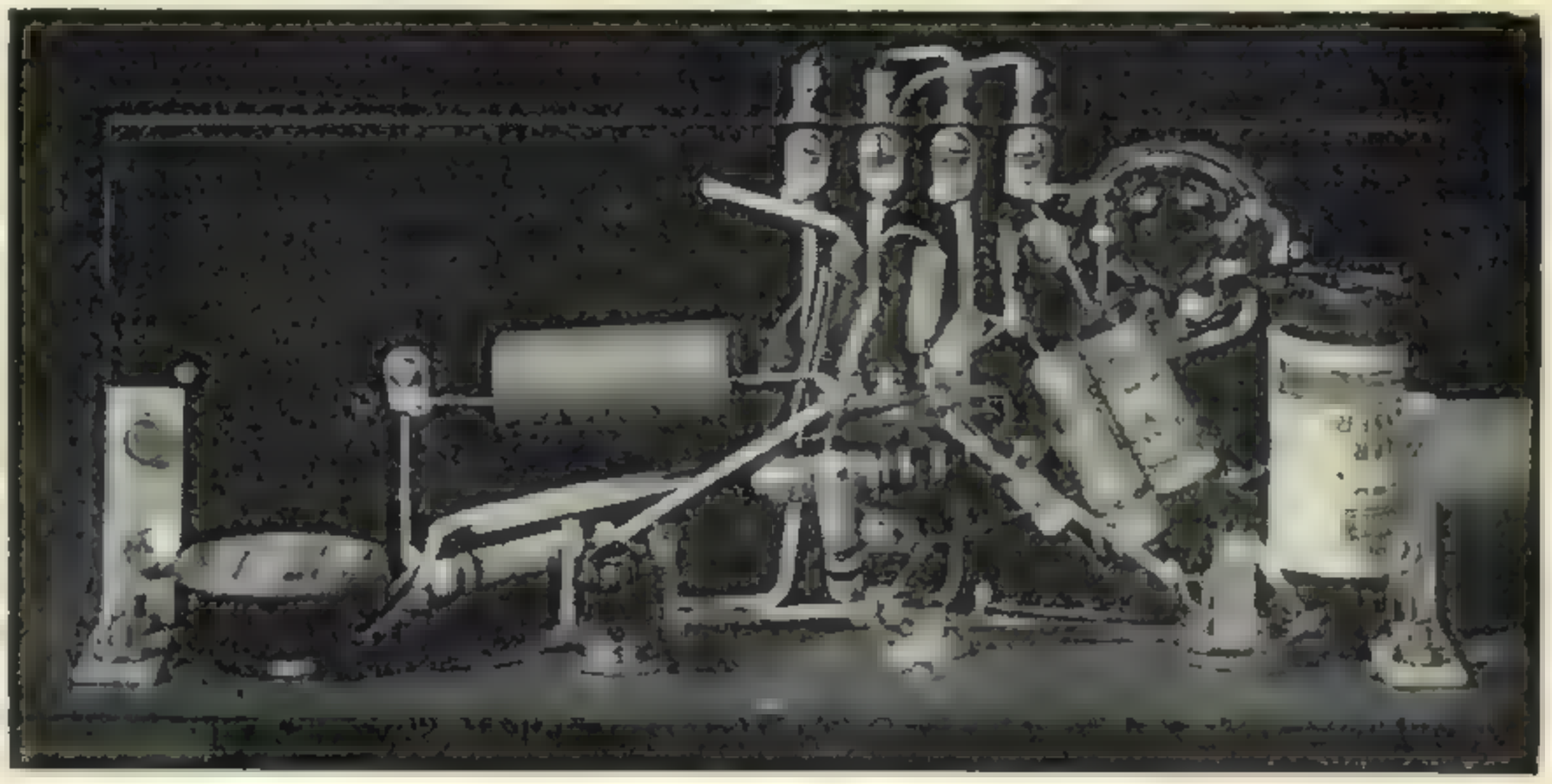
The set makes a very effective c-w monitor, and is the only reliable way of judging the quality of one's signal. For this service, the antenna rod is removed and the regeneration control turned full on. Chirps, warbles, and other undesired modulations will show up instantly.

Too few amateurs are aware of the fact that a regenerative receiver can be used with a superheterodyne as a very effective preamplifier. This requires no modification of the regenerative set. It is connected in parallel with the superheterodyne's input, or across the transmission line. The regenerative receiver as a preamplifier works by the familiar principle of re-radiation. Signals picked up by the antenna are amplified by the regenerator and fed back into the transmission line, where they are received at much higher level by the super. The detector should be adjusted just below the point of oscillation. Since most transmission lines are low impedance, 52 or 600 ohms, a small capacity, such as the aforementioned gimmick must be used to couple the regenerator to the transmission line. Excellent results have been obtained using the rod antenna of the regenerative set. In this case, the super is connected with the regenerator's antenna through a small capacity.

The set may be calibrated and used as a highly stable and accurate signal generator. For this service, the antenna rod is shortened to its minimum length, the regeneration set at full, and the antenna capacity set at minimum. It may then be calibrated by any of the usual methods. Due to the use of batteries, the stability is quite high, but if the calibration is to be maintained, it must be operated under similar conditions of antenna length, antenna coupling, and regeneration.

The complete set, including batteries and tubes, can be built for about ten dollars. In view of its many uses, it is ten dollars well spent.

(*Coil data on page 60*)



Wiring placement is not critical, but can be copied from this under-chassis view.

Monthly DX Predictions - October

OLIVER PERRY FERRELL*

IN THIS ISSUE a certain number of changes have been made in the method of presenting the Monthly DX Predictions. The principal and most noticeable improvement has been the addition of a CRPL modified mercator world map. The map is used to depict the areas where each of the four MUF (maximum usable frequencies) charts are applicable. In this manner it is possible to quickly establish the area covered in the graph, the appropriate azimuth and route of the signal, as well as the MUF.

Our readers will also note that we have discontinued use of the OWF outline. This is a policy based on experience gathered through the operation of the prediction charts. It has been found that the OWF outline is only necessary in commercial installations or in the few instances where it was necessary to arrange schedules. For those who made use of the OWF, we point out that it is generally computed on the basis of 0.85 of the MUF. Under the present circumstances, the monthly predictions represent average conditions. If the OWF outline is used it will be found that the MUF average on all days will exceed the OWF value by about 90% of the total time.

Eastern U.S.A. to Asia: The average October MUF over paths from the W1, W2, W3 and W8 call areas to Japan, Phillipines and Korea is illustrated in graph No. 1. The MUF outline indicates that the 20-meter band will open around 0630 hours EST. Peak conditions will coincide with the slight bulge in the outline at 0800 hours EST. After 0930 hours there will be considerable absorption over this path making the 20-meter band unsuitable for DX contacts. A fair to good 10-meter opening is predicted at 1545 hours. The peak time for 10 meters over this path is 1645 to 1830 hours EST. Some 20-meter signals may be heard after 2100 hours, until 2330 hours, but for the most part these will be weak.

Western U.S.A. to Europe: The predicted October conditions from the W6 and W7 call areas to Europe is shown in graph No. 2. The MUF indicates that 10 meters will probably open around 0645 hours PST. Fair to good conditions are predicted until about 1130 PST. Peak 10-meter conditions should be observed between 0745 and 0930 hours. It will be found that the conditions over this path are determined almost entirely by the MUF appearing at the eastern end of the path. However, since this path travels within the auroral zone it is expected that there will be considerable day-to-day variation in the observed signal intensities. Conditions on 20 meters between these areas should be good during the last part of this month. The band will probably peak a little after 1800 hours PST and will close sharply around 2115 hours.

Central U.S.A. to South Africa: The graph No. 3 illustrates the average DX conditions predicted for paths from W8, W9 and WØ to South Africa. Some scattered 20-meter signals may be expected throughout the night. 40 meters after 2100 hours CST until 0100 hours CST should produce some good DX. 10 meters will probably open with excellent signal strengths around 0600 hours CST. This band should remain open until after 1700 hours CST since the MUF between these areas is controlled almost entirely by F2-layer densities at the western end of the path. The peak for 10 meters will correspond to the peak of the MUF outline between 0900 hours and 1000 hours CST. Possibly on good days very strong signals will be heard until 1300 hours with fair signals thereafter. As the absorption level drops at 20 meters we may expect to hear fair signals after 1730 hours CST.

Southern U.S.A. to East Indies: The graph No. 4 shows the average conditions predicted for paths between the W5 and W4 call areas to the East Indies. At this particular season this path presents some interesting contrasts. There is a distinct possibility of a short 10-meter opening between 0845 and 0930 hours CST. The MUF will then drop to about 22.0 mc with a second possible 10-meter opening after 1245 hours CST. The latter opening however, will undoubtedly be fairly weak due to the very high level of absorption. A tertiary 10-meter opening with fair to good signal strengths may be expected from 1630 to 2030 hours CST. The 20-meter opening at 0630 hours should be very sharp with good conditions observed from 0730 to 0930 hours CST. This will be the principal 20-meter opening, although some scattered and weak signals may be heard after 0100 hours CST until shortly before dawn. The period from 0300 until 0800 hours CST should provide fair 40-meter DX conditions.

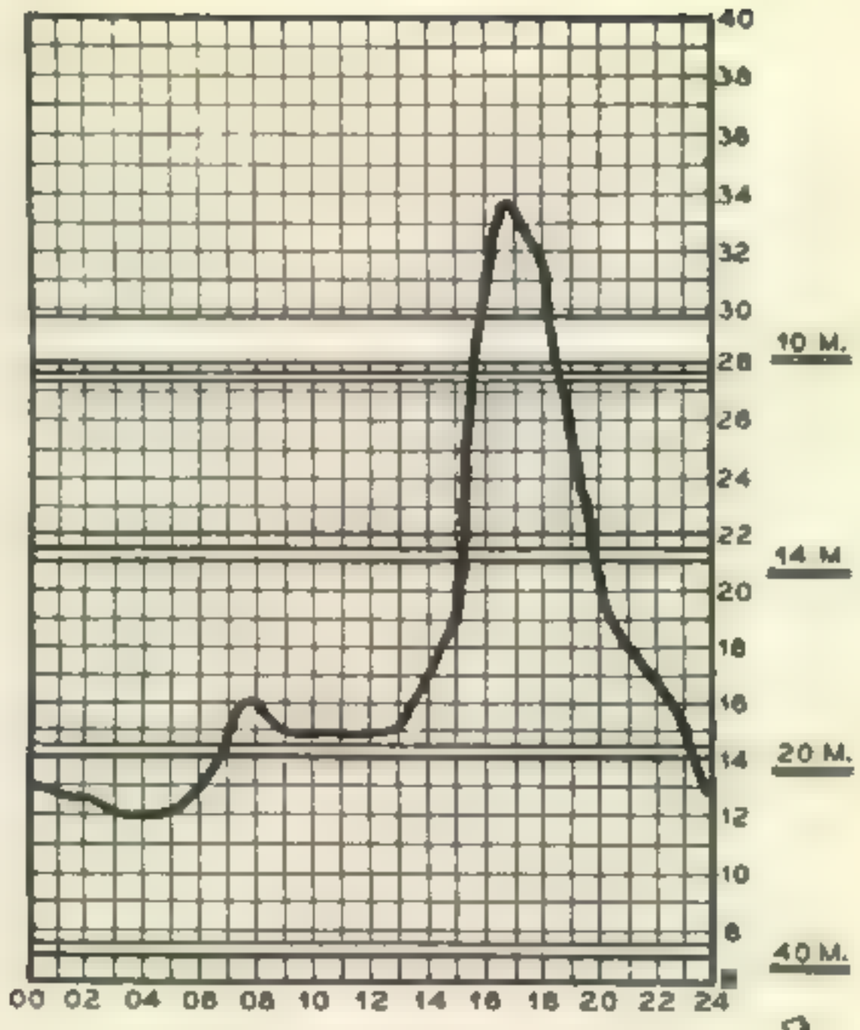
Transcontinental MUF: The average conditions for October indicate an MUF of about 44.0 mc between 1300 and 1600 hours EST. Actually, during the first week of October the MUF will probably not exceed 42.0 mc at the peak period of each day. Toward the last week of October the MUF should rise to as high as 47.0 mc. This very high value of MUF indicates that the 10-meter skip will be less than 1000 miles. 10 meters should open on the east-west path around 0820 EST and will probably close after 2100 hours EST. The 20-meter band will remain open during the entire night with only a slight dropout of signals around sunrise. 40 meters will make an excellent showing this month with good signals from 2300 to 0400 hours EST.

Eastern U.S.A. to Europe: An interesting factor in the conditions over the North Atlantic path to Europe is the shift of peak conditions on 10 meters.

*Assistant Editor, CQ.

(Continued on page 72

MONTHLY DX PREDICTIONS



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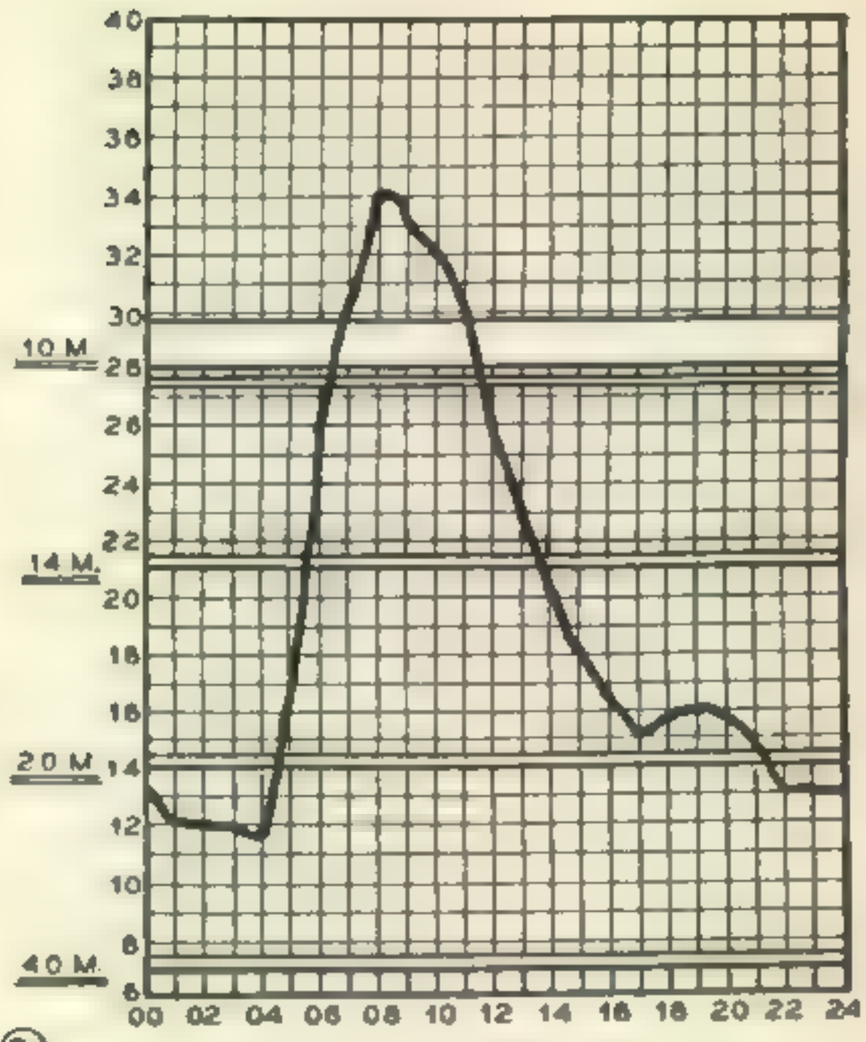

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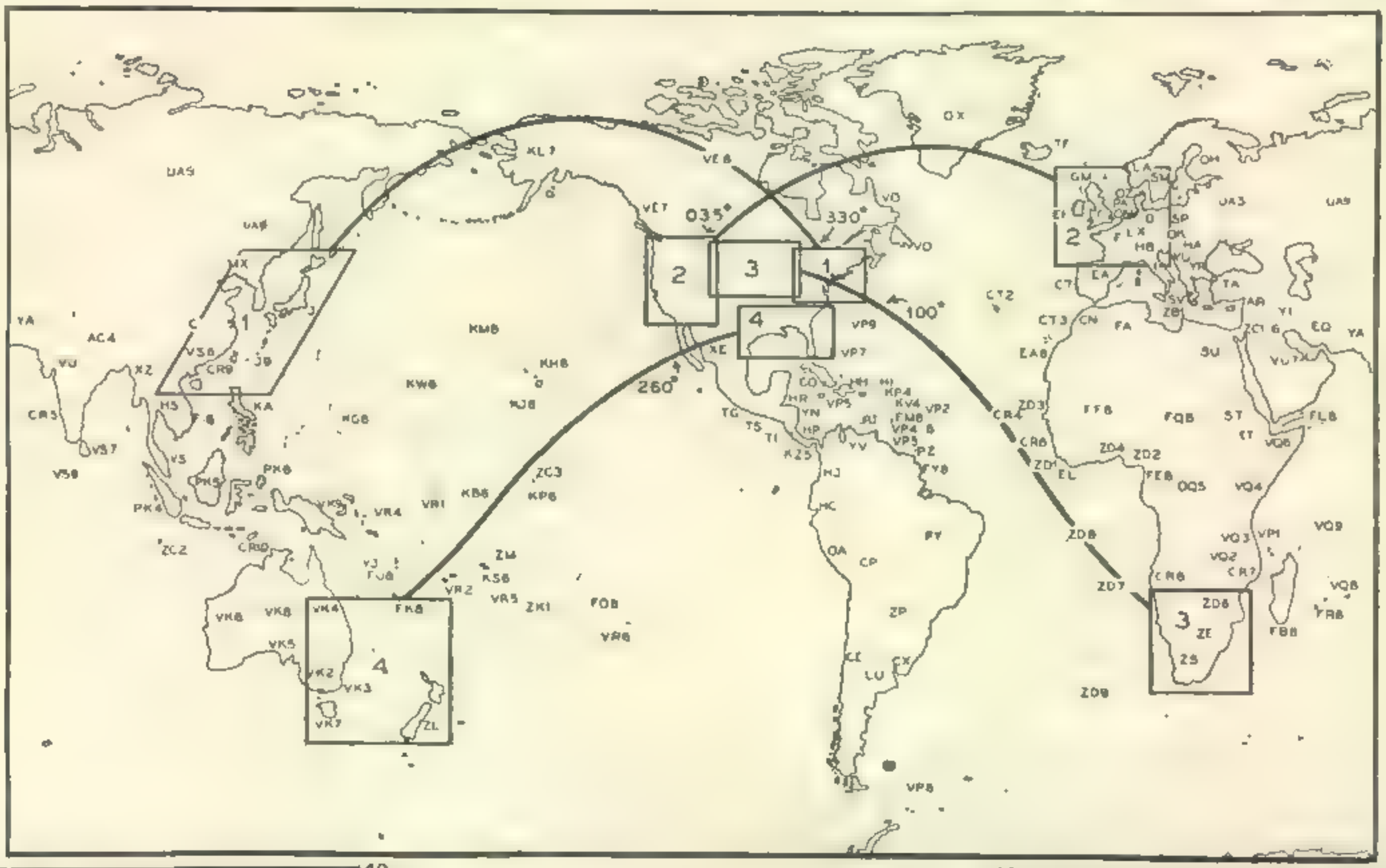
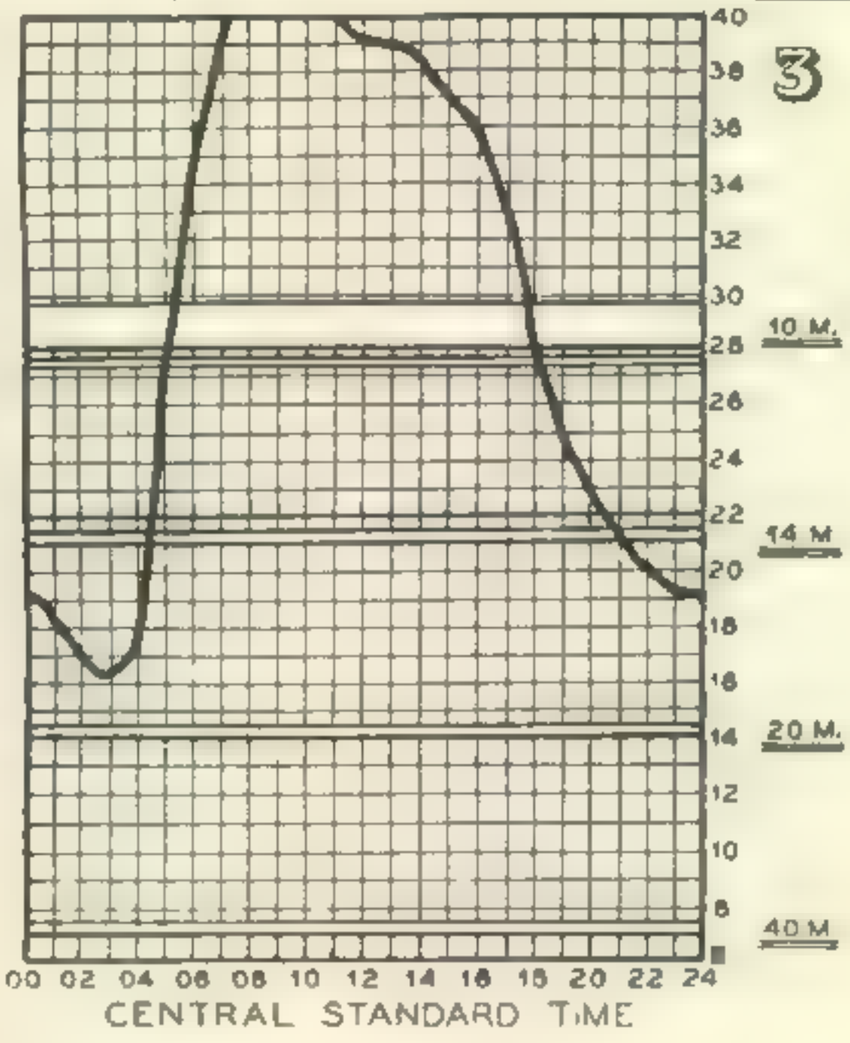
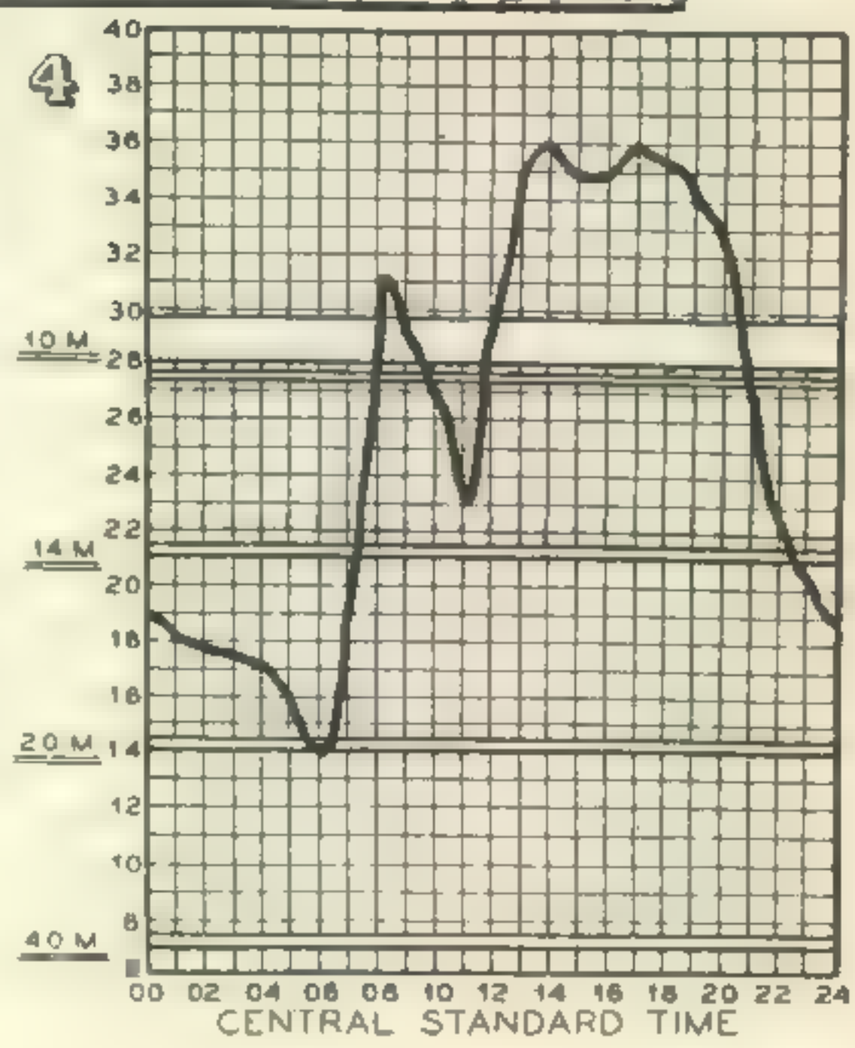




Monthly F2-layer Propagation Predictions—Charts show the maximum usable frequencies over the paths indicated in the world map. The abscissa shows the local standard time at the point of origin of the path. The ordinate shows the frequency in megacycles. The important amateur bands for which the two heavy polar lines that indicate the upper and lower frequency limits of these principal bands.

Azimuth—Radio transmission is known to vary considerably with geographic latitude and longitude. Each path MUF as illustrated is calculated on the basis of the short path. This is the path shown in the map. Generally the long path would be about 180° removed from the short path azimuth.

Variations in Forecast—All graphs are monthly predicted average conditions. On ionospherically quiet days some variation amounting to less than 15%, may be expected. The graphs do not indicate radio propagation conditions during ionosphere storms, nor are they adjusted to include the effects of sporadic E layer formation, long or short scatter and abnormal absorption. Radio propagation disturbances of the ionosphere storm type are most severe for paths which pass through the polar regions, the effects gradually tapering off towards the equator.

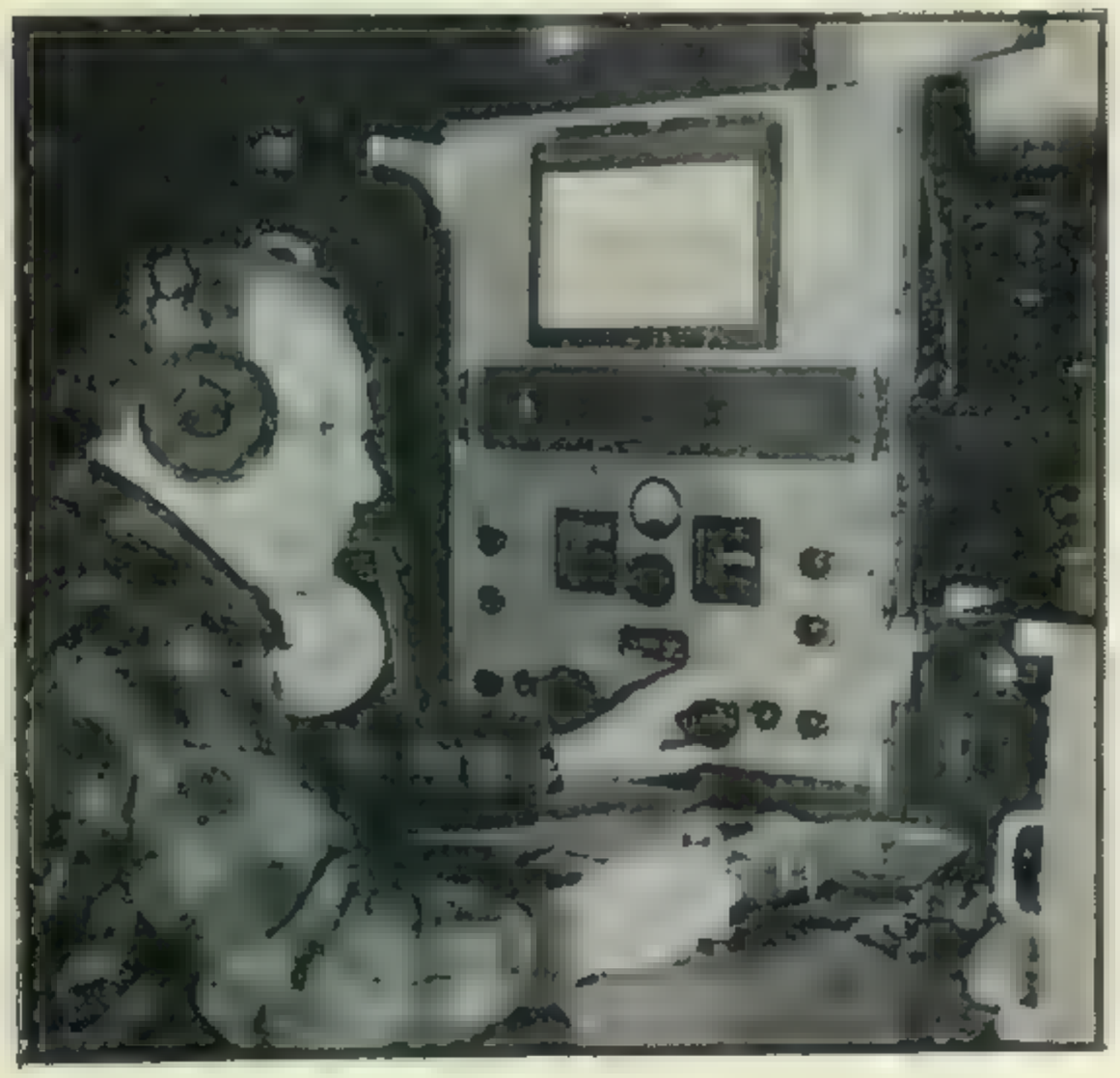


Conducted by HERB BECKER, W6QD*

MARK GRAFFIS, W6PFD, has submitted his 40 confirmations, and they have been approved by the committee, thus entitling him to W.A.Z. certificate No. 3 in the postwar period. As a matter of fact, Mark made his W.A.Z. in an eight-month period, which really shows some fast and furious DX work, not the least of which, of course, is obtaining the 40 confirmations. W6PFD is located in Temple City, which is a suburb of Los Angeles. He was one of the lucky boys to work *AC4YN*, this taking place just about a year ago. Our congratulations to W6PFD for this achievement, and his countries which stand at 152 in the Honor Roll.

If any of you fellows feel like sticking your neck out, all you have to do is start writing a DX column. For example, no sooner do we print about *ZC1AN* being a phoney, which we received from G2MI, who in turn should know, when up pops some guy who claims ZC1AN is sending cards. Whether or not it is the same ZC1AN, I can't tell you, because the one we were crying about was supposed to be a "G" station in England signing ZC1AN; and who now is supposed to be some place where he can't sign anything. But, when we hear about cards coming through from ZC1AN, it just doesn't make too much sense. Of course, there could be another ZC1AN, but, here again, I don't know.

**Send all contributions to Herb Becker, 1406 South Grand Ave., Los Angeles 15, Calif.*



Peter Bach, W2GWE, Honor Roll leader in countries QSOd. The entire total was worked on 14 mc.

Brass Pounder's Chatter

WØNUC, who is having a little friendly competition with WØGKS, received a letter from *VR5PL* stating that he would soon have a 4-element rotary, a rhombic, or two "V" beams with which he hopes to get some European QSOs with the help of the 500 watts he expects to have. One of the "Vs", or the rhombic, will be on the States, and his now famous chirp will soon be history, he hopes. The limit on Tonga is 50 watts, but VR5PL has special permission to use unlimited power. The letter also states both VR5PL and *VR5IP* will be on Tonga for another 2½ years, so all the boys should be able to work a VR5. WØNUC is mighty proud of his QSL card from VR5PL which states, "The first VR5/W contact ever made."

W3JTC has discovered that patience and persistence pay off. He was listening to *VR6AA* and *ZL2PM* during a QSO. They were operating on opposite ends of the 20-meter band. Finally VR6AA switched to phone, and W3JTC still swung the dial on his receiver from one end to the other ready to nail VR6AA. Finally, his persistence was rewarded, and he grabbed VR6AA, who was still on phone, for what proved to be a swell QSO. He also has some new zones, such as *UA9CB*, *UAØKQA*, *J3AAD*, and *FQ3AT*.

In a letter from *HS1LN*, it looks as though these other boys are OK, too . . . *HS1DI*, *HS1CF*, and *HS1MR*. Each of these boys will QSL, but please do *not* attempt to send your card until you receive his. There is another station in Siam, *HS1SS*, Sgt. King, who will welcome QSL cards, and they *can* be sent to him in care of the American Embassy, Bangkok, Siam.

New stuff for W2RGV includes *GD6IA*, *UI8AB*, *UQ2AB*, and *UA9CH*. W6TT adds a couple in hooking *ZS4P*, and *UA3BD/UC*.

We have just received a letter from LX1AB, who is LX QSL manager, and he said *LX1AX* is unknown in Luxembourg, and the address he gives as "P. O. Box 10" is incorrect as all boxes have three figures in their numbers. *LX1AB* says that the only genuine LX stations are listed in the call book, and all others are pirates. In case you are interested, the QTH of the LX QSL Bureau is: W. Berger, LX1AB; 20 Louvigny Str.; Luxembourg, (G.-D.) Europe.

Now we are going to grab a few items from the DX column in *The Shortwave Magazine*, written by G6QB. It looks as though G2PL is the highest British station in the Honor Roll having worked all 40 zones and 167 countries. Those who, within the last couple of months, have worked their 40th zone

W.A.Z. HONOR ROLL

C.W. & Phone		
W2BXA	40	169
W6VFR	40	166
W6PFD	40	152
W2GWE	39	173
W3BES	39	170
G2PL	39	167
G6ZO	39	166
W8BKP	39	166
W9RDZ	39	165
W2HHF	39	163
W8HYC	39	159
W6ITA	39	155
W6MJB	39	151
W6ENV	39	150
W2COK	39	147
G5DQ	39	144
W6SA	39	143
W8LEC	39	142
G5WW	39	142
G5YV	39	141
W6SN	39	137
G8KP	39	135
G6QB	39	135
W6KRI	39	134
W6RDR	39	134
W6TT	39	133
G2CDI	39	132
G3DO	39	129
G3FJ	39	127
G5BJ	39	126
W9NRB	39	126
W6WKU	39	125
W7FZA	39	124
WØYXO	39	122
WØGKS	39	121
G5RV	39	121
W6SAI	39	121
G5WM	39	120
D2KW	39	118
G6BS	39	117
W6LER	39	114
G3AAK	39	114
W6OMC	39	114
W6QD	39	97
W3JNN	38	148
W2CYS	38	144
W3EPV	38	140
G2WW	38	136
W2PEO	38	136
W4BRB	38	133
G2AJ	38	130
W2IOP	38	130
W3IYE	38	130
W9IU	38	130
W9RBI	38	129
W8FJN	38	129
W3GHD	38	126
G3DO	38	126
W2RDK	38	124
G8IL	38	123
W8CVU	38	119
G8RL	38	115

C.W. & Phone		
W5CPI	38	113
ON4JW	38	110
G3QD	38	109
W6TI	38	108
G3ZI	38	107
WØNTA	38	103
W7GXA	38	102
W6UZX	38	101
OK1AW	38	98
W6LEV	38	79
W4CYU	37	145
W8NBK	37	130
WØNUC	37	126
W4OM	37	126
W3EVW	37	123
W2HZY	37	120
W1NMP	37	19
W1JYH	37	114
W3JTC	37	114
W1KFV	37	113
GW3AX	37	110
W4FPK	37	110
G5CI	37	109
WØSQO	37	101
W2BLS	37	100
W4ML	37	100
W6ANN	37	95
VK2ACX	37	94
W9YNB	37	93
WØSQO	37	92
W5ASG	36	141
PY1DH	36	114
G2VD	36	112
KP4KD	36	107
G8RL	36	101
W6AM	36	99
G3QD	36	98
G6WX	36	95
W8HSW	36	85
G6PJ	36	64
W1BIH	35	113
G2CNN	35	107
W2RGV	35	105
W9NLM	35	101
W2CWE	35	100
W9VND	35	99
W2TJF	35	89
G6MR	35	76
W6LN	35	63
CM2SW	34	117
G8QX	34	99
G2CNN	34	98
W3JKO	34	91
W4DIA	34	86
G2AO	34	84
W7HTB	34	84
W8WWU	34	84
D4ANM	34	77
W9MZP	34	77
G5MR	34	74
W7FNK	34	54

C.W. & Phone		
W2ZW	33	115
W4QN	33	94
G8IP	33	88
G2LC	33	85
WØAZT	33	81
GM2UU	33	79
W5BK	33	79
GW4CX	33	78
W9EMW	33	74
W2JA	33	74
W3KDP	33	74
W9TB	33	68
J4AAK	33	57
W2PUD	32	81
G8FF	32	78
GW4CX	32	76
W6LRU	32	76
W9FNR	32	74
WØOUH	32	71
G3VA	31	101
W6ZZ	31	80
W4HA	31	79
G2AO	31	77
W6MI	31	73
W6IFW	31	71
W9KMN	31	66
G2WQ	30	76
G5OQ	30	74
WØLAW	30	67
W1DQH	30	65
D4AVC	30	64
G6BB	30	64
W9WEN	30	62

Phone		
W1HKK	37	118
W6DI	37	115
W4CYU	36	124
W1JCX	36	120
W8BKP	36	112
W2BXA	36	108
G3DO	36	103
W3DHM	36	96
W8BF	35	108
W1MCW	35	105
W1NWO	35	92
W9HB	35	89
W6PCK	35	82
W2DYR	34	104
W6SA	34	69
W2ZW	33	113
W5ASG	33	83
GM2UU	33	77
W9RBI	32	86
W8BIQ	32	79
WØHX	32	74
W2HY	32	73
W2NXZ	32	57
W6PXH	31	79
W5LWV	31	75
WØSQO	30	74
W4HA	30	67

Because in most instances postwar DX records now equal or surpass the best pre-war work the W.A.Z. Honor Roll is listing only postwar contacts as of this issue.

1948 DX Marathon

CQ is sponsoring a DX Marathon for the year 1948. Many of the DX men feel that by the first of the year a DX Marathon will revive some of the interest that has been lost during the terrific last two years of DX. A simple set of rules governs the DX Marathon:

1. The 1948 DX Marathon begins January 1, 1948, and closes December 31, 1948.

2. Competition will be worldwide and on a zone-to-zone basis. In other words, the high station in each of the 40 zones will be given an award as winner of his zone.

3. Classifications will be the same as in the Honor Roll, i.e., "C.W.—Phone" and "Phone only", thus actually making two winners in each zone.

4. In order to receive credit, claims sent to us for zones and/or countries must be postmarked within sixty days from the date of the QSO. This will assure listing the current monthly scores in CQ and eliminate last minute entries.

5. Due to the tremendous amount of detail work, please list all DX Marathon scores on a separate page from Honor Roll scores and other DX news, and mark plainly "DX Marathon". This will greatly assist W6DI and W6SA, of our committee, in tabulating the Marathon scores for you.

6. Zone and country lists must be submitted in the same manner as though they were for the Honor Roll: the zones listed in numerical order showing the call letters, date, and time; the countries in alphabetical order by country, followed by the call, date, and time.

7. The CQ DX Zones of the world, and the official DX Country list, will be used for the yardstick.

To many of you, the beginning of the 1948 DX Marathon may seem a long way off, but we wanted to get it published so the overseas DX men will have plenty of time to hear about it. The cooperation of all DX men in the states to help spread the word overseas is requested. We think that as the years progress, it will be interesting to see who the winners are from one year to another.

are G5DQ, G5YV, G6GB, and G5BJ. However, since none of these boys has 40 confirmations, their scores will appear in print as 39 zones. G6QB brings up a good point when he says that he, personally, now feels like sitting back and just working DX friends again . . . allowing any new countries that drift in, by accident, to add themselves to the total. After all, there are two sides to amateur radio. You can either chase new DX, and condemn yourself to a lifetime of working weak signals through QRM, or you can settle down to long rag-chews with old friends. G2DF is now on the Isle of Man and he says with his new prefix and suffix, the call sounds so improbable, that many people think he is a pirate. You see, he now signs GD2DF/A. Don't worry . . . he is good as gold, and just for the dickens of it, try sending that call yourself.

G2CDI, who has parked mostly on 28 mc, has departed for Barbados, so we'll expect him on the air there shortly. G6XS says that *EP3H* is active on 14 mc and is located in Khuziston, South Persia, and undercover. If you work him, QSL to G3LK. G2FZO had his antenna blown down, and hasn't been able to get it up quite as high as before. However, since then, he has done nothing but work DX which was not formerly possible.

HB9CE says that *LZ1AK* and *HE2UD* are phonies. HB9CE will again be in Liechtenstein and will be operating *HE1CE*. Still quoting from G6QB's column, we see that he has a letter from *ZC1AL* stating that he opened up in March and is the only ZC1 station in operation. He works phone on 14,200 and 14,300 kc., between 1500 and 2200 GMT.

KX6USN Bikini Atoll, Marshall Islands

No, fellows, Bikini is not a separate country from the Marshalls. *KX6USN* was apparently assigned to this group by the Navy, and Ed Schuler, W6VOE, is one of the boys doing the operating. Ed is the youngest of three brothers, all of whom are hams. Many of us can remember when Ed would tag along while his brothers bought radio parts in the various stores. Anyway, Ed said they will definitely QSL all contacts, and we'll try to get a picture of their layout one of these days.

I suppose many of you fellows are hot after *W8WEA/TRUK*. This is a good one to track down around 14,080.

A letter from *ex-HZ2TG* tells us he is back in this country, and is now W9MRS, but soon to become a WØ. Here is something of interest, which Russ, formerly HZ2TG, would like to have known. HZ2TG will QSL via WØZRA all contacts between April 23, 1947, through June 24, 1947. All contacts made after June 24, 1947, will not be routed through WØZRA.

MD1D is ex-LI2CL due to the issuance of new calls to the amateurs in the Cyrenaica division of Libya. MD1D is the R.A.F. Signals Officer in this locality, and they, apparently, are the ones who issue the calls. Actually, the prefix LI is assigned to Norway, so this new MD1 prefix is a welcome change. MD1D says there will probably be four new stations opened up in the Benghazi area, and two in Tobruk. MD2 is also Libya; MD3, Eritrea; MD4, Somalia; MD5, Suez Canal Zone; MD6, Iraq and MD7, Cyprus.

KH6KL, in a letter to us, states that he operated from Palmyra Island on June 16 and on June 19 from Christmas Island, and then from Pago Pago in American Samoa on June 25 and 26. From there he went to Canton Island where he operated on July 1. He has a complete log of all the stations worked, and QSL cards are being mailed to everyone. KH6KL was using an AR-8506-B receiver, while the transmitter wound up with a GL1623 with 125 watts input . . . power was generated from a 300-watt plant. The antenna was generally about 80′ long, end fed, and usually hung up between a couple of convenient trees.

Canton Island

For those who would like to know a little something about Canton Island, *KB6AA* says it is on the Honolulu—Australia airway, about 3° below the

(*Continued to page 66*)

(Number one of a series)

NATIONAL

National

COMPANY
INC.

Engineers
and
Manufacturers

RADIO

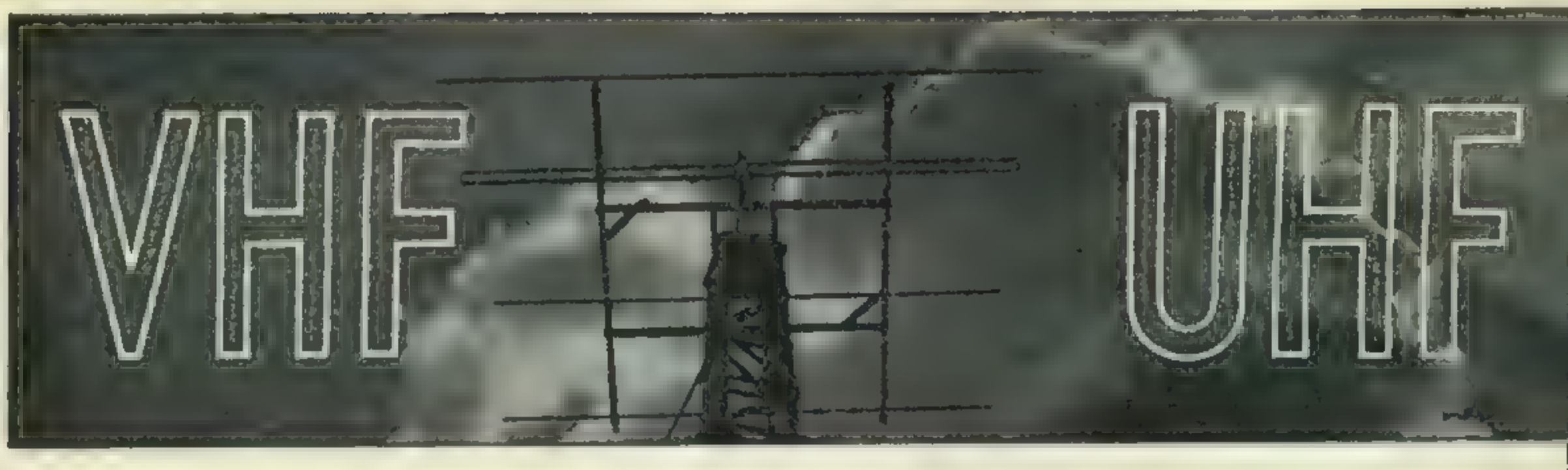
To many amateurs this sort of page will need no introduction. To those of you who are not familiar with National Company, we would like to introduce ourselves and state our policy regarding the series of advertisements that will appear on this page.

Originally founded in 1914, National Company has been engaged in the development and manufacture of equipments and components useful to the amateur as well as to commercial and military users of radio and electronic equipment.

Each month we propose to devote this page to the discussion of subjects which will be of interest to the seasoned ham, radio beginner and prospective or newly licensed amateur. We plan to discuss problems commonly encountered in the construction and operation of amateur radio equipment, and will endeavor to present these discussions in a manner that will be easily grasped by all amateurs. Our selfish motive, of course, is to better acquaint the reader with the radio parts and equipments manufactured by National Company.

If you have any pet problems that you would like to see written up on this page, drop us a line and we will try to arrange it. We expect to draw heavily on amateur thinking inside and outside of our organization and the following amateurs now employed by National Company will contribute their share:

Name	*Call Letters*	*Name*	*Call Letters*
Paul Silbert	W1AGE	C. L. Gagnebin	W1ATD
Herman S. Bradley	W1BAQ	Lawrence Amann	W1BG
James Ciarlone	W1BHW	Calvin Hadlock	W1CTW
Henry Minich	W1DEU	Harvey Poore	W1DKM
Seth Card	W1DRO	Harry Gardner	W1EHT
J. Francis Bartlett	W1EU	William Osborne	W1EXR
George R. Ringland	W1EYZ	Don Hinds	W1FRZ
Robert Murray	W1FSN	Barton Mitchener	W1GNV
David Smith	W1HOH	John Baxter	W1HRK
Vincent Messina	W1HRW	Jack Ivers	W1HSV
Edmund Harrington	W1JEL	Alfred Zerega	W1JMK
Robert Williams	W1JOX	Frank Lopez	W1KPB
Harold Gould	W1KWU	Richard Gentry	W1LEN
John Stanley	W1LFF	Leo Green	W1LML
Francis Waden	W1LNV	Michael Calabrese	W1LRV
Richard Thurston	W1MFZ	Frank Nault	W1MKC
Robert Wallace	W1MQV	Victor Penney	W1MTS
Donald Poulin	W1MXC	Dexter Atkinson	W1MYH
Martin Oxman	W1NYU	Ralph Hawkins	W1OEX
Carl Carter	W1OGV	Ronald Heckbert	W1OLU
John Prusak	W1OPT	William McNamara	W1OTK
Thomas Saragosa	W1PBN	Harry Harris	W1PFF
William Bartell	W1PIJ	Charles Coyle	W1PMR
Harry Paul	W1PMS	Hyman Kana	W1PSJ
S. W. Bateman	W1RX	Clark Rodimon	W1SZ
William Doyle	W1TV	Raymond Jordan	W1QIU



Conducted by VINCE DAWSON, JR., WØZJB*

LOOKING BACK OVER the previous reports of the last few months, we find that July-August 50-mc Es openings have tapered off considerably, and much faster than in 1946, indicating that F2 will be in full swing by the time this reaches you.

While 50-mc skip has slackened, the boys on the 144-mc band have been having some very nice long distance hauls by ducting, from W8 to W9 and along the East Coast.

From W3GKP, in Silver Springs, Md., we find that W3KUX set up a new 144-mc record by working W3EKK/1, W2PAU/1 and W2PFQ/1 all portable atop Mt. Cadillac, Bar Harbor, Maine, a distance of 600 miles, on the evening of Aug. 4-5th. Full details on page 22.

W9ZHB, Zearing, Ill., 90 miles S.W. of Chicago, worked on August 1st, W8WJC, W8MLE and W8UKS all in the Cleveland area. W3GV of Erie, Pa., was heard and W3GV also heard W9ZHB, but contact was not made. W9ZHB says that the duct was really terrific as he could hear the squeals of superregn receivers and QRM from modulated oscillators was bad indeed. The night of August 8th and a.m. of Aug. 9th and Aug. 26th were also good for ducting. On the morning of Aug. 9th from 8-10 a.m. CDT, WØHAQ in Davenport, Ia., heard on the taxi and police band of 156-160 mc, stations in New Jersey, New York, San Antonio, Ft. Worth and from Los Angeles. The early morning hour evidently prevented a good DX record.

During the opening on Aug. 1-8th W9ZHB advised that only the horizontals got through, as the verticals around Chicago were not successful in working the longer distances. The rig at W9ZHB is an 829 with 90 watts and a 6-element stacked beam, the receiver a VHF-152A into an RME-45. Evidently other stations were successful in making some nice hauls, but these are the only ones that have come to our attention in time for this issue.

On 6 meters XE1KE worked LU6DO for the first XE-LU QSO. The contact was made at 1655 EST on August 27th and lasted 35 minutes. Signals were S5 to S7 over the 2650 mile path.

Send all contributions to Vince Dawson, c/o D & S Radio Supply, 107 South 3rd St., Manhattan, Kansas.

VE1QZ, Halifax, N. S. Included in this complete station are ARC-5 2-meter rig, 6-meter transmitter, field-strength meter, HQ129 and VHF 152.

50-mc Predictions

The latest information concerning the F2 MUF is for the month of November. The predicted average MUF to Great Britian, France and the Netherlands from the Middle Atlantic states and New England areas is 44 mc, while the peak on a few exceptional days will go to 51 mc. The average MUF will increase over paths from Europe to Atlantic Coastal areas further south. The MUF to Florida will be 47 mc at 1045 EST, going to *53 mc* on good days. Considerable emphasis should be placed upon the possibility of working 6-meters into Africa. Figures show the path from W1-2-3-8 call areas to the southern and central section of Africa, to be right over the following paths; Brazzaville-0800 EST 48 mc, going to 48.5 mc by 1300, the peak being 0900 1200 EST. Johannesburg is 45 mc at 0900, staying there until 1200 EST. Both of the above paths may be exceeded by as much as 10% on good days, making possible 6-meter contacts with stations in the above mentioned African areas.

With the increased MUF over the paths to the north, east and west there will be a *decrease* in the MUF to South America. Very unusual conditions are predicted, however, which include an opening in the *late evening*. The figures shown give a much better picture of the predicted conditions from the S.E. section of the U.S. to OA4AE in Lima, Peru. All times shown are EST; 0900-46 mc, 1000-49 mc, 1100-50 mc, 1200-46 mc, 1300-44 mc, 1400-44 mc, 1500-45 mc, 1600-46.5 mc, 1700-42 mc, 1800-42 mc, 1900-40 mc, 2000-32 mc, 2100-34 mc, 2200-39 mc, 2300-46 mc, 0000-44 mc and 0100-26 mc.

From the above you can see that 28 mc will be open almost round-the-clock for work to South America. The 50-mc peak will be around 1000-1200. It's going to be fun and some nice DX for those who stay with the band and really plug it. Skeds with stations outside the U.S. are urged on 28 mc and with activity picking up all over the world some good DX will no doubt be worked.

W-DX Record

Who holds the W-DX record on 50 mc? What U. S. stations have worked the greatest distance in the states or outside of them. Some very nice QSOs were made this past summer including; W7ERA-W4FLH, W4DRZ-W7BQX and from the W6s to the W1s. If you have made one of these long hauls, please let us know as we would like to keep this record along with our other scores. The mass of reports sent last summer have been passed on to Perry Ferrell for analysis, which prevents our checking them and the distances involved

New 5514

ECONOMICAL TUBE TO GROW WITH!

STANDARDIZED FOR ECONOMY

The 5514 supplants the HY30Z, HY40, HY40Z, HY51A, HY51B, and HY51Z. Concentration on this one 65-watt triode gives you a better tube for much less —only $3.95. Two 5514's take 525 watts input in class C; deliver 400 watts output in class B audio—at CCS (continuous commercial service) ratings.

EFFICIENT AT ALL PLATE POTENTIALS

Low internal tube drop of the 5514 permits excellent efficiency over a wide range of plate potentials. In class C, two 5514's give plate power outputs of 60 watts at 400 volts, 400 watts at 1500 volts. Furthermore, associated components are economical and still usable as power is increased. Truly the 5514 is a tube to grow with.

READILY INTERCHANGEABLE

The 5514 has a standard 4-pin medium base, conventional overall dimensions, a 7.5-volt filament, and a high mu (145). Dependent upon the triode it replaces, the 5514 may require slight readjustment of filament voltage and/or grid voltage and driving power. Chances are you will need no new parts.

ALL-PURPOSE ZERO-BIAS TYPE

In either modulator or r-f amplifier, performance of the 5514 is exceptional. One HY69 or 807 can overdrive at maximum input two 5514's in class C. You need no costly fixed bias for protection. Economical, efficient, interchangeable, versatile — the 5514 was designed for you. See it at your jobber's.

HYTRON TYPE 5514

High-Mu All-Purpose Transmitting Power Triode

GENERAL CHARACTERISTICS

Filament	thoriated tungsten
Potential	7.5 ± 5% volts
Current	3. amperes
Grid-plate capacitance	7.9 μμf
Grid-filament capacitance	7.8 μμf
Plate-filament capacitance	1. μμf
Max overall length	6-9/16 inches
Max diameter	2-7/16 inches
Bulb	ST-19
Base	low-loss 4-pin medium

ABSOLUTE MAXIMUM CCS RATINGS—CLASS C

Characteristic	Mod.†	Unmod.	
D-c plate potential	1250	1500	v
D-c plate current	175	175	ma
D-c plate power input	175	262	w
D-c grid potential	-200	-200	v
D-c grid current	60	60	ma
Plate dissipation	43	65	w
Frequency (max ratings)	60	60	mc

PLATE POWER OUTPUT (CCS)
TYPICAL OPERATION*

	Plate Potential				
Service	400	750	1250	1500	
Class B audio#	50	150	330	400	w
Class C unmod.	30	70	165	200	w
Class C mod.	30	70	135	- - -	w

† Carrier condition with a max modulation percentage of 100. *To determine useful power output to load, subtract circuit and direct radiation losses from plate power output. #For 2 tubes.

5514 FEATURES

- Zirconium-coated Speer graphite anode
- Grid leads to both pins two and three
- Plate cap has ceramic insulating bushing
- Dual low-resistance plate connections
- Low-loss synthetic lava insulators
- Convenient low-loss 4-pin medium base
- Elements firmly supported by dome micas
- Efficient at low or high plate potentials
- Only 13 w drive for 262 w input class C

SPECIALISTS IN RADIO RECEIVING TUBES SINCE 1921

HYTRON
RADIO AND ELECTRONICS CORP.

MAIN OFFICE: SALEM, MASSACHUSETTS

50-MC DX HONOR ROLL

Calls	States	Districts	Others
W4GJO	45	10	VE1-2-3-OA4
WØZJB	45	10	VE2-3-4-7
WØUSI	45	10	VE2-3-7
W9DWU	45	10	
WØDZM	43	10	VE1-2-3-7
WØQIN	43	10	VE1-2-3-7
WØTQK	42	10	VE2-3-4-7
W9ZHB	42	10	VE3-4-7
W9ZHL	42	10	VE1-2-7
W1CLS	42	10	VE1-3
WØYUQ	42	10	VE3
W3CIR/1	41	10	VE1
WØINI	41	10	VE2-3-4
W8NSS	40	10	VE1-4-VP7
WØSV	40	10	VE7
W6WNN	40	10	VE7
W4GIY	40	10	VE1
W1LLL	40	10	VE1
WØYSJ	39	10	VE2-3-7
W5AJG	38	10	VE3-XE1
W5ML	38	10	VE3-XE1
W6UXN	38	9	VE3-7
W4QN	37	10	VE2-3-OA4
W5JLY	37	10	VE7-XE1
W9UNS	37	9	
W5VV	36	10	VE7-XE1
W7FDJ	36	9	VE7
W5HF	35	10	VE1-3-4-7
WØBJV	35	10	VE2-3
W8QYD	35	10	VE1-4
W5VY	35	8	VE7
W2BYM	34	10	VE1-VP7
WØDKS	34	10	VE3
W5FRD	34	10	VE7-XE1
WØJHS	34	10	VE1-2
W7FFE	34	9	VE7
W1HDQ	33	10	VE1
W4DRZ	33	10	VE1-2-3
W6PUZ	33	10	VE3-7
W7KAD	33	10	VE7
W2RLV	32	10	VE1-2-3
W9PK	32	10	VE3-7
W7ERA	32	9	VE7
W1JLK	32	9	
W4FBH	31	10	VE1-2-3-XE1
W5LCZ	31	10	VE3-XE1
W3OMY	31	10	VE1-VP7
W9ALU	31	10	VE2-3-4
W4HVV	30	10	VE1-2-3
W9UIA	30	10	VE1-2-3
W5WX	30	10	VE4-7-XE1
W5RSC	30	9	VE7-XE1
W4EQM	29	10	
W3RUE	29	10	VE1
W7HEA	29	9	VE7
W6OVK	29	9	VE7
W4WMI	28	9	VE1-3-7
W4EQR	28	10	
W6ANN	28	9	VE3-7
W1CGY	28	8	VE1
W4FQL	28	9	VE1
W7ACD	27		
W5LBG	26	8	VE7-XE1
WØDNW	26	10	
WØYKX	26	10	VE2-3
W6NAW	25	9	VE7
W5ESZ	25	8	VE7
W7BQX	25	7	VE7
W7JPA	24	8	VE7
W5LIU	24	8	
W9AB	23	9	VE1-2-3-4

again, so it's up to the holder of the 50-mc W-DX record to speak up.

International Notes

W7ACS/KH6, Gene Piety, is now back in the Islands and hopes to be on the band by the middle of September. The rig will be low power at first, but a full 'jug' is coming up, along with the F2 at his location near Pearl Harbor.

Last month we mentioned that we were honored with a visit from Bob Mitchel, KH6DD. Well just 2 weeks later we got a phone call from none other than Tex Brewer, J9AAK. Perhaps this is some sort of a record, both sides of the 50-mc DX holders in the shack, within 2 weeks of each other. Tex, J9AAK is now back in the States for good, and will be attending Communications School at Sellman Field, Alabama. Of course he can't wait to get a rig on the air, just to see how the State-side signals sound on 50 mc. The call of W5KDA/4 will be on very soon, so give Tex a greeting when the skip is in.

Getting back to the other side of the 50-mc DX record, we hear from Bob Mitchell, KH6DD/4 at Quantico, Va. Bob outdid himself and has a nice 50-mc location which even includes a house. Course there was a slight catch to the deal; Bob has to allow the Young Ladies' Bible Class to meet in his basement, come every Sunday, for their lessons.

From England, via *The Shortwave Magazine*, we learn that there are over 300 Gs on the 58.5-60 mc band and 1,000 mile contacts with North Africa have become almost common-place. With 11 European countries now represented on the band, things have certainly happened to promote real interest amongst the Gs. ZB2A, Gibraltar, was about to give the band up in disgust, but on July 14th G5BY was heard. Since then the score has been raised considerably and ZB2A can be found most every evening from 2030-2330 DST on c.w., around 58.5 mc.

While on the European subject, we have a report from Alois Weirauch, OK1AW, telling of his 5-meter activity. The rig at OK1AW is an M.O. Hartley with a single LS50, running 40 watts, the antenna a Windom 20.42 m long for 7-14-28 mc. A small two-tube portable receiver with super-regen detector and audio amplifier is used for receiving. On June 30th, Alois worked G5MQ, who gave him R5-S6. The same day several other Gs were heard. OK1FF, OK2MV and OK3ID also worked some of the DX. OK1AW mentions that conditions were very good from 2045-2200 local time and the OKs are always looking for more signs of v-h-f DX.

VE7VY in Vancouver, B.C. says that 6 meters certainly has pecularities of its own. For instance, Oliver can work to W7DF and W7BQX in Washington any time of the day and the signals have no QSB, when he bounces his sigs off a mountain due North of him. Yet the other fellows, VE7AFZ, AHZ and NM, receive them most of the time with QSB, but their beams have to be directly south on the W7s. Another queer thing is that VE7AEZ can work the Seattle gang most any time, while VE7VY can only get them on skip, yet VE7AEZ is only 15 miles N.E. of VE7VY. Some more bouncing, no doubt, and possibly VE7AEZ is further away from the mountains to the south, which gives the signal a chance to get started and over them, before absorption becomes too great. The rig at VE7VY is an 829B in the final with 90 watts feeding a 4-element wide spaced beam, 50' high. The receiver has an r-f stage and a 6SA7 osc-mixer.

VE1QZ says the following stations are active on 50 mc in the Halifax area; VE1PQ, VE1SF and VE1QZ. The rig at VE1QZ is a Millen exciter

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6 and 2-meter beams at VE1QZ, Halifax, N. S.

driving an 829B to 75 watts, a 3-element beam horizontal 20′ high and for receiving a VHF-152 into an HQ-129X. Frequencies used are, 50.10-50.40-50.70 on phone, c.w. or m.c.w. With this set-up Oscar has worked 86 different stations in 19 states and VE3, since May 23rd when he first got on the band.

OA4AE, in Lima, Peru, says that LU9EV is on 50 mc daily and looking for skeds on 28 mc and will make checks on 50 mc with any of the gang. Buz incidentally is ideally situated for this Fall's high MUF. Paths worked out by Perry Ferrell for OA4AE show them to be good to XE1KE, Southeast U.S., South Africa, Liberia, Algeria, Morocco, Tunisia and Egypt, with a good chance of getting into the Balkans. Course Buz's only problem is having someone on in these respective countries, but even cross-band 28-50 mc will be sump'n!

50-mc Openings

As mentioned at the start of the column, 50-mc Es skip has tapered off quite suddenly and faster than last year when the band openings lasted up until October. The north-south path has been fair in August, with W4GJO observing openings on several days. Double hop has again taken place, when things appeared normal on 28 mc, and the gang in the middle-west listened to a dead 50-mc band.

Evidently all these peculiarities are just an indication of what we can expect for the coming F2 work in the next 4 months. Without a doubt we shall see some nice contacts for those who are diehards and stay with the band. Let's hope lots of the gang stick with it and watch that in-between spectrum of 30-50 mc. The MUF can be determined by listening for commercial harmonics, and the beam-approach systems in Europe, mentioned with calls and frequencies in last month's column. Calls on 50 mc and monitoring the 28-mc DX portion of the band will also bring results. And don't forget the 58.5-60 mc band where the Europeans reside at the present time.

Es openings reported to us indicate the band allowed contacts to be made on the following days. July 25, 26, 27, 28, 29, 30, Aug. 1, 2, 3, 9, 10, 11, 14, 15, 16th.

50-mc Gang

In the old days the v-h-f column presented data on antennas, equipment and other miscellaneous information. It has been our contention that personal opinions are affected by too many factors to be correct for different sections of the country, particularly concerning antennas and polarization. However, if we could get both sides of the story they may prove very interesting. To do this we should like to have your experiences with antennas or equipment and promise that they will be presented from an unbiased viewpoint. Such discussions will give the gang a picture of what happens in the different sections of the country. For instance, what difference did W1CLS, W3CIR/1, W7ERA, W7DDJ and W7FFE note when they stacked another beam above their present one? We do know their double hop contacts jumped considerably, and they should present some nice results on the F2 work this Fall, where a good low angle of radiation is desirable. Actually the stacking of beams ½ wave above the others adds very little to the power gain of the array (3 db), but it does lower the angle of radiation. Topics like this could be presented to the gang, if we could get reports.

Northern Wyoming is now represented on 6 meters by W7JRG, the frequency being 50.46 mc. C.W. is used exclusively, the rig a very much converted ARC-5, feeding a 4-element wide-spaced beam 16′ off the ground. To get a better v-h-f location the set-up is located at the KWYO transmitter sight, which overlooks the fair city of Sheridan. What with 3 ops, the station is expected to be on almost 24 hours. The first contact was made with W9ZHL on Aug. 21, with W7IPD at the key.

144-mc Gang

The v-h-f gang around Chicago, perhaps the most ardent pounders of the band, have now commenced a rather novel idea of giving 144 mc publicity. Here is the way it works.

Every two weeks they broadcast a roundtable forum (like on the Chicago roundtable broadcasts on the BC band), from the high elevated location of W9ENP on top of the Skyliner Hotel, some 40 stories. The forum consists of 2 average hams, 1 guest and 2 engineers or technicians. V.H.F. is then discussed for an hour or so. This thoroughly covers the Chicago area, but to really make a very fine job of it, the program is *relayed* to cover *6 states*. The route goes something like this, W9IPO to W9GGH in Kenosha, Wisc., who puts it out to the Milwaukee gang and across the lake to W8CVQ in Kalamazoo, Mich. Going west from W9BBU to W9ZHB to WØHAQ, in Davenport and to WØNFM-IFB in Solon, Ia., W9RHL Hobart, Ind., relays to the east. Plans are under way to extend this net. Everyone is invited to listen in every other Tuesday night. Enthusiasm like this is what it takes to convince others that 144 mc is an excellent band for local work, and on occasions some real DX. Since antennas are very small, approximately 35″ being a half-wave, some really high gain arrays can be made.

Along with the other DX that is being worked on 144 mc we run into this interesting bit of news.

Coming from W4FBH in Atlanta, who got it from W4OK, who works for Eastern Air Lines. Well W4OK got a letter from one of the EAL boys in Houston, Texas, who claimed that about July 19th he contacted for five minutes on 130.3 mc, a British plane over Shanghai, China. They have checked to find out if this is legit and have learned that such a plane was scheduled to be there at that time; however, no confirmation from the plane's operator or pilot. The same feller in Houston also said that an engineer with AT&T in Houston had to make changes in equipment in order to eliminate QRM from *Canada* on 152 mc. We are attempting to

(*Continued on page 62*)

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MODEL 908 MICROMATCH standing wave ratio and r.f. wattmeter will let you put more power into your antenna — from your present transmitter — for only **$29.90.**

MODEL 800 U.H.F. RECEIVER is E. P. Tilton's A.R.R.L. HANDBOOK, "T.R.F. Superregenerative Receiver" — the sweetest performing 2½ and 1¼ meter, non-radiating receiver we've seen — in finished commercial form for only **$39.75** less tubes and power supply.

MODEL 700 U.H.F. TRANSMITTER is xtal controlled for maximum signaling effectiveness in 2½ and 1¼ meter bands, yet costs you only **$36.95** less tubes and power supply.

MODEL 701 TRANSMITTER goes into more amateur stations to produce more CW and phone DX than anything else, it seems. A 6AQ5 Tritet drives an 807 to 75 watts CW, 30 watts phone, input, 80 through 6 meters. Modulator is built-in. Less coils (3 per band at $.50 ea.), power supply, 4 tubes and crystal, it's the outstanding transmitter "buy" at **$36.95.**

MODEL 801 RECEIVER covers 450 kc. through 60 mc., consisting of r.f. stage, regenerative detector, two a.f. stages and built-in speaker, it's the old reliable standby — just the thing for portable, emergency, test — and serious ham reception. **$29.95** for 6.3 volt operation; **$28.95** for 1.5 volt dry battery tubes; coils, **$1.00** per pair.

MODEL 703 is new — a pre-tuned bandpass freq. multiplier. Driven by any VFO or xtal, it puts you in any band 80 through 6 meters, on selected freq. as fast as you can turn two knobs. Its 807 gives 40 watts max. output and instant control of every band. Price **$49.90.**

MODEL 802 SUPER-HETERODYNE RECEIVER is an amateur-band-only receiver using i.f. regeneration to give variable phone up to single-signal CW selectivity. Following A.R.R.L. HANDBOOK teachings, it provides more than usual 8-tube results, over 7 feet of band spread on 80, 40, 20, 16, 11, 10 and 6 meter bands, all for only **$38.95** less tubes, power supply and coils at **$1.00** per pair.

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MODEL 702 VFO includes NFM. Covering 3,000 through 4,000 kc., its 3-watt output may be multiplied 80 through 2½ meters. It's something brand new — a crystal controlled VFO including and using a 5 mc. xtal frequency standard to give complete break-in operation, superbly clean keying — the VFO you've dreamed would come. Only **$49.90** less tubes, including power supply.

TYPE 619 AIR TRIMMER CAPACITORS are high Q, low-loss, good up beyond 500 mc. for tuning, trimming, coupling, etc. 3 mmfd. to 30 mmfd. spread out over 3 complete revolutions for easy adjustment. Like all SILVER instruments, price is more than right—only **$.30** ea., net.

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The YL's Frequency

Conducted by LOUISA DRESSER, W1OOH/2*

THE "WAR BETWEEN women and hams," on which W2OLB has commented frequently in this column, seems at last to have reached a peaceful conclusion—for a few W9 hams and their XYLs at least.

From W9OEJ, Walter Lester, comes a request for information regarding YLRL, saying that his XYL has just received her own ticket. He adds: "This was due to the combined efforts of W9RLK, W9VSU, W9JIO, K9AAH and W9OEJ (myself), who are conducting classes for 'radio widows' who wish to have a hobby in common with their OMs. So far three girls have their tickets—W9BCR, Elinor Schlan, whose brother is K9AAH; W9BCB, Helen Greene, whose OM is W9JIO, and W9BBQ, Ruther Lester, my XYL.

"The drop-outs have been deleted. There were a few! The girls found theory the big stumbling block. Three more will be ready very shortly. If any XYLs in the Chicago area are interested in our 'radio widow's' club, K9AAH is the new secretary."

Congratulations to the new licensees. Congratulations, too, to the enterprising instructors. Mayhap many another OM could take this gentle hint.

For W9BBQ, and any others wishing information regarding the Young Ladies Radio League, we suggest you contact the secretary, Louise Willomitzer, W6VWR, 211½ N. Berendo, Los Angeles, Calif., or your local district chairman, names and addresses for whom appeared in this column in September CQ.

Completing that D/C list, we have these two additional YLs:

1st district: W1MCW, Lou Littlefield, 19 State St., Cape Elizabeth, Maine.

Canada: VE2HI, Ethel L. Pick, 535 Lansdowne Ave., Westmount, Quebec.

By the way, YLRL is planning its first QSO party of this season for Sept. 27-28. YLs only, no OMs this time: just a hen party.

As this goes to press, most of the YLs of Greater New York are busily engaged in operating and allied activities at amateur station K2AL, set up especially for the national American Legion Convention being held here in Manhattan the last week in August. So far,contrary to what might have been expected from all reports of high-spirited fun-making during such conventions, the station is still intact and operating very successfully, with plans for an extensive emergency 2-meter net covering the 60-block line of march of the convention parade.

Personal Mention

Congrats to Marion Hart, W2QVM. *Air Facts* magazine carries in its July issue an article by her entitled "Flying in Cuba." It's all about her recent cross-country trip down there from N.Y.C.

Lenore, W6NAZ, has a new combination 10 and 20-meter beam in operation and plans a Zepp for 80 and 40. In the meantime she is joining the girls who are getting together Tuesdays at 10 a.m. PST on 20 c.w. Lenore is working for YL-WAS.

Lizette, W7HDS, says the best YL net on 20 phone to date includes herself, W7JFB, W7HHH and W7KCV on 14,236 kc. on Thursdays.

How about info on other YL nets? We'll be glad to report such nets here for other YLs who may like to join in.

Helen, W2NFR, received a big stack of QSLs on the last delivery from the QSL Bureau. Attached was a card on which was printed, A Prayer—Please, God, help me to keep my nose out of other people's business." And below it, "What are you running—a Kalifornia Kilowatt?" P.S. Helen was using 250 watts.

Clara, W6TDL, had a personal visit from Comdr. Pete Bertelli, formerly J9ANA of Okinawa. While he was J9ANA, Clara handled traffic and personal QSOs for him. She also had a visitor from Australia, Robbie Robbinson, VK2US.

During August we had the pleasure of playing host to CO2JK, Juan Berndes, from Habana, who went on 2 meters for the first time from our station—operation on that band thus far being unknown in Cuba. Listening across the band John heard W2LUG signing with W1OSQ and saying his beam was directed toward Boston, Mass. CO2JK gave him a call using his own call (as well as ours) which, when he heard the CO call, gave Bob kind of a start. He began rotating his antenna and was surprised—

(*Continued on page 76*)

Lucille Sweet, W2SCI, YL of the month.

*Assistant Editor, CQ

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Tnx es 73,

Bil Harrison, **W2AVA**

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75 watts output on 11-10-6-and 2 meter bands! Xtal controlled. See Millen and Bliley ads in this issue—and then rush your order in to Harrison for quickest delivery!

Model 90810, less tubes, coils, crystal, and power supply..... **66.15**
Coils, per band $3.60
Set of tubes—**$20.04** (With HSS 829-B—**$7.95**)
Millen 90281 Power Supply—**$84.50.** Tubes **$2.50.**

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BEAMS

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MIMS Signal Squirter dual 10 and 20.	$358.00
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4 element 10 meter	361.80
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is perfect for FM and the new records. Response is within one DB from 20 to 20,000 cycles. Bass and low pass filter treble controls. Equalized phono input for GE Reluctance and Pickering pick-ups. Phono-Tuner input switch. 15 Watt output with only 2% total harmonics above 60 cps. 2.5-5, 8-12, 16-24 ohm outputs. Model A-323B. Complete **$125**

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ST-202-A Up to 125 watts input on all bands 10 to 80. Band switching of exciter stages. Complete kit including twin power supplys, with chassis and cabinet, less accessories... ..... **92.80**

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TEMCO GA
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Here's a ROTATOR for your BEAM!

- Runs on 24 to 33 Volts AC or DC
- Reversible—only three wires required
- Approximately ¾ RPM
- 7056 to 1 Gear Reduction (No free swing!)
- Powerful motor, rugged precision gear train, and sturdy thrust bearing—will support and turn any ham beam.
- Weatherproof housing

Used on aircraft to control pitch of propeller, these dependable motors are easily converted into an FB beam rotator! Used, but in perfect tested working condition, with conversion data..... **12.95**

(Partially converted motor housing freed, brake and brake release solenoid removed, terminals jumped, control leads pulled, and limit stop lugs removed. **$3.80** extra).

Phone and Mail Orders add **$1.25** for packing

OVERLOAD RELAYS with ELECTRICAL RESET

Protect your tubes, etc. by using this relay to shut down power supply when plate current exceeds safe value. Sensitive, compact, rugged. Pulls out on 15 MA or more. For high currents use adjustable shunt resistor. (Or easily rewind coil form with a 34c spool of No. 28 Enam for spring adjustment of 150 to 600 Ma). Reset coil 115 Volt, 60 cycle.
Navy inspected, brand new. Worth many times my low HSS price! **1.65**

5 KW AC PLANT

Signal Corps PE-197. 120 Volt, 60 cycle regulated output. Remote control, self-starting 13½ HP, 4 cycle gasoline engine. Constructed for dependable continuous rugged duty. Brand new, export packed. Complete with battery, remote cables, maintenance tools, and detailed instruction manual. **$545**

JONES MM-2 MICRO-MATCH

Accurately measures Standing Wave Ratio and RF Power over 3 to 162 Mc range. Coupler unit has coaxial cable connectors and may be inserted in the line at any point. Indicator unit may be in any convenient location.
Coupler Unit (specify 52 or 72 ohm), with complete instructions for using any 1 ma meter as indicator....**$19.95**
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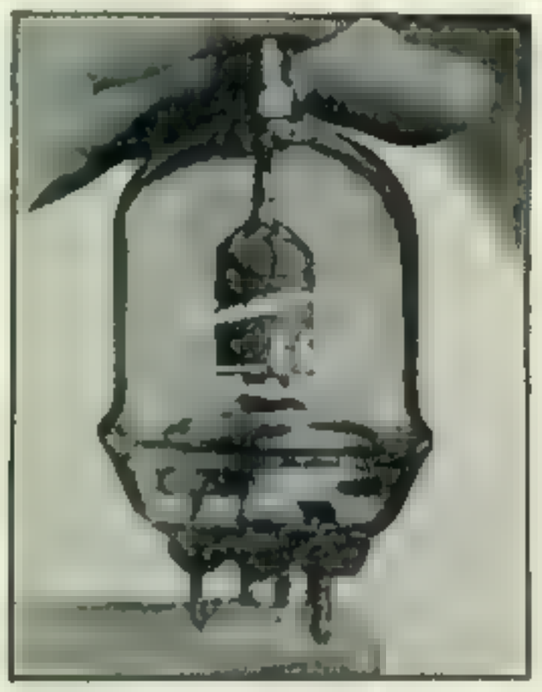
PARTS AND PRODUCTS REVIEW

65-Watt Tetrode

A 65-watt tetrode has been announced by Eitel-McCullough, Inc., of San Bruno, Calif. This new vacuum tube is physically small, radiation cooled, and is designed to fit commercially available sockets. Type 4-65A should fill the long-standing need for a low-voltage tetrode suited for mobile applications. It features an instant heating 6-volt thoriated tungsten filament, non-emitting grids, and a processed metal plate . . . all enclosed in a hard glass envelope.

Excellent performance is obtained over the entire rated plate voltage range . . . 400 to 3000 volts. In typical operation (Class C telegraphy or FM telephony) at a plate voltage of 400 volts and



.1 amp. of plate current, a power-output of 28 watts is obtained with less than 2 watts of grid driving power. In the same type of application a single 4-65A operating at 2000 plate volts will provide 200 watts of power-output. Performance is maintained above 200 mc. Further operational data and characteristics are obtainable by writing for the 4-65A data sheet available from Eitel-McCullough, Inc., 178 San Mateo Ave., San Bruno, Calif.

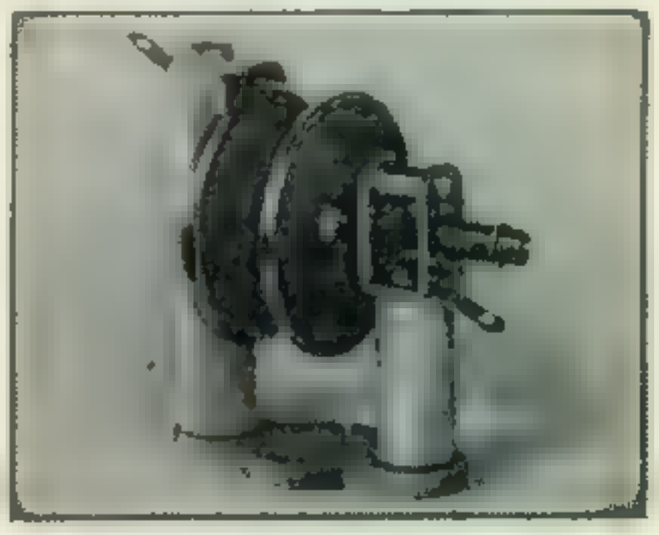
High Frequency Converter

Columbus Electronics Inc., 229 South Waverly St., Yonkers, N. Y., are manufacturing their new Model HFC 610 high-frequency converter, available in two ranges: 27 to 30 mc and 50 to 54 mc. The unit employs a 6AK5 high-gain r-f amplifier stage,

a 6AK5 mixer, a 6C4 stable oscillator, and self-contained, regulated power supply. The HFC-610 provides sharp tuning and separation between stations, low internal noise, and image-free reception. The dial is directly calibrated in frequency.

Neutralizing Condenser

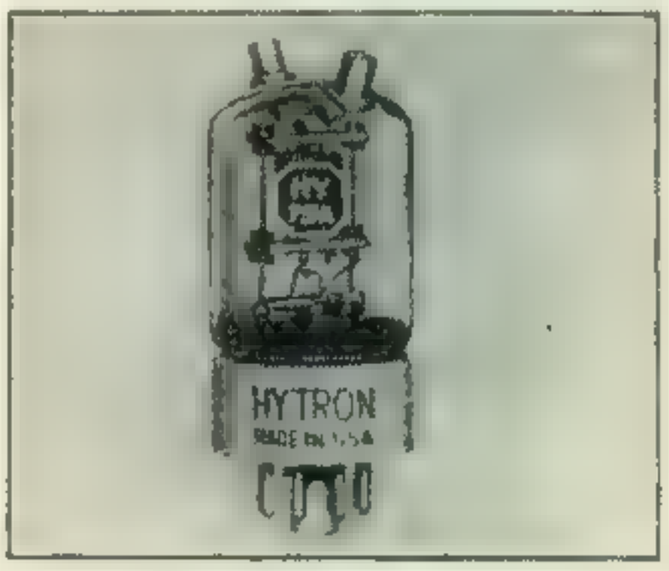
Hammarlund Mfg. Co., 460 W. 34 St., N. Y. 1, N. Y. is now producing the new NZ-10 neutralizing condenser. The NZ-10 is designed to neutralize any tube having a grid to plate capacitance of 10 $\mu\mu f$ or less. Suitable for either single ended or push-pull



circuits, the NZ-10 has particular application in high-frequency stages where very fine capacity adjustment is required. The locking device and rotor adjustment are designed for operation by screw driver. Access to the rotor locking and rotor adjustment is from the same direction so that the NZ-10 is a very compact unit. A positive stop prevents shorting the plates at maximum capacity position.

V-H-F Triode

The Hytron HY75A is a medium-power, v-h-f triode designed specifically for efficient operation as an oscillator and amplifier at frequencies from 50 to 430 mc. It is ruggedly built to withstand oper-



ation in portable and portable-mobile equipment. Incorporating most of the electrical features of the HY75, the HY75A gives useful power output as a Class C oscillator up to 25%. Maximum plate current is increased to 90 ma. Grid-to-plate capacitance is sharply reduced to 2.6 $\mu\mu f$. Details may be obtained from the manufacturer at Salem, Mass.

V-F-O Exciter

The B&W 500 VFO Exciter just announced by Barker & Williamson, Inc., 237 Fairfield Ave., Upper Darby, Pa., claims inherent stability equal to that of the finest nontemperature controlled crystal units. Each unit is temperature cycled for drift compensation and is supplied with a calibration

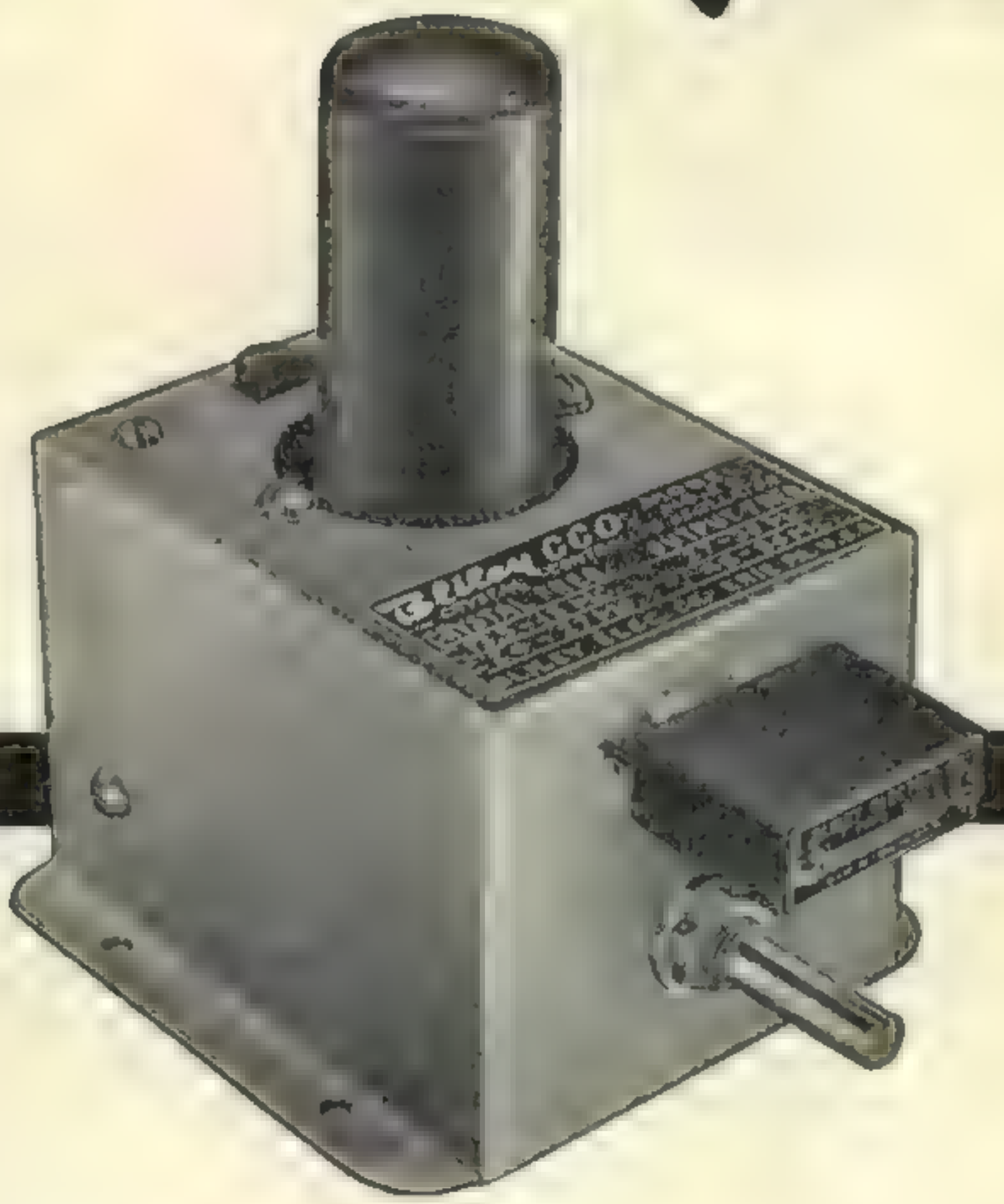
(*Continued on page 82*)

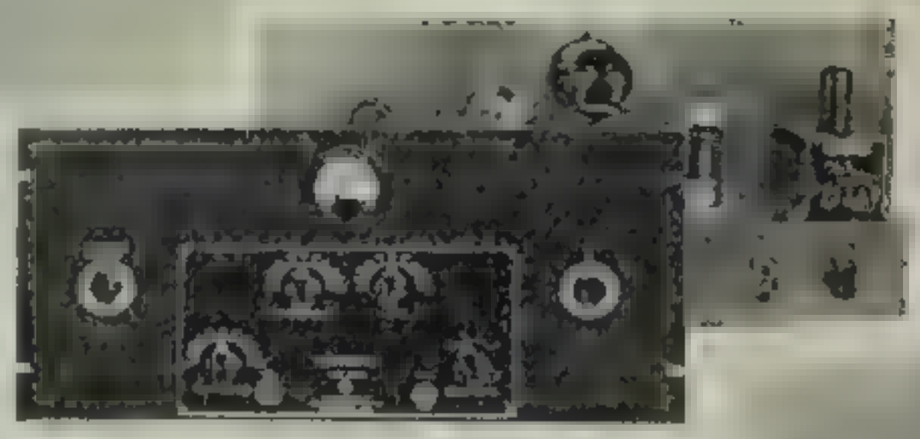
Bliley announces . . .

a new crystal controlled oscillator for the 2-6-10-11 meter bands

CCO

MODEL 2A





Now available for your amateur rig, a completely packged oscillator unit designed and engineered to utilize the nany advantages of crystal control on 2-6-10-11 meters. With the CCO-2A output is obtained directly on 6-10-11 neters; operation on 2 meters requires only a tripler stage.

The CCO-2A is the ideal oscillator for an efficient 4-band ransmitter such as the Millen 90810*; or as a basic unit n new construction. Features include: adequate drive for .h.f. medium power tubes, single dial tuning for maximum utput, no self-oscillation under any operating conditions.

Peak performance of the CCO-2A is obtainable only when sed with Bliley type AX2 plated crystals for 10-11 meers and the new Bliley AX3 plated crystals which multiply to the 2-6 meter bands. See table for relation between crystal frequency and output.**

\+ \+ \+

AVAILABLE NOW THROUGH YOUR BLILEY DISTRIBUTOR

CCO-2A *less tube* **(6AG7)** *and crystal*	**$9.95**
AX2 *crystal, 11 meter multiplier,* **13580-13715 Kc**	**3.95**
AX2 *crystal, 10 meter multiplier,* **14000-14850 Kc**	**3.95**
AX3 *crystal, 6 meter multiplier,* **25000-25500 Kc**	**3.95**
AX3 *crystal, 2 meter multiplier,* **24000-24333 Kc**	**3.95**

Type AX2 *units supplied ± 30 Kc of specified frequency*
Type AX3 *units supplied ± 5 Kc of specified frequency*

The Bliley CCO-2A is employed as a built-in component of the Millen 90810 high frequency transmitter

TYPE	CRYSTAL	CCO-2A OUTPUT
AX3	25-27 Mc	50-54 Mc
AX3	24-24.6 Mc	48-49.3 Mc
AX2	13.6-13.8 Mc	27.1-27.6 Mc
AX2	14-14.85 Mc	28-29.7 Mc

Bliley
CRYSTALS
CRYSTAL CONTROLLED OSCILLATORS

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"away ahead"

"...in a comparison check, the BUD VFO-21 is away ahead in stability..."

WRITES

Edward Zimmerman W4FNQ

He says: "The performance of the VFO-21 is very satisfactory in every respect. In a comparison check with the Bud and one selling for a little more than twice as much money, the Bud is away ahead in stability.
In using the VFO-21 "as is", into a mediocre antenna system on 40 meters, I have been able to work consistently into Cuba, the Bahamas and around the state, the tone reports being almost invariably T9X. Its use in conjunction with my final amplifier (push-pull) 807's at 150 watts input) is entirely satisfactory, the output being enough to overdrive the 807's."
It is unsolicited letters like this from our satisfied customers that convince us that the BUD VFO-21 is an instrument that belongs in your shack.

The BUD VFO-21 Your Cost $52.50

1. Compact and entirely self-contained.
2. Stability comparable to crystal.
3. Plug-in coils for highest efficiency.
4. A dual purpose unit having V-F-O operation, with provision for switching to crystal operation.

SEE IT AT YOUR LOCAL DISTRIBUTORS

BUD

BUD RADIO, INC.

CLEVELAND 3, OHIO

Postscripts

Long Island (N. Y.) Hamfest

The Federation of Long Island Radio Clubs will sponsor its 11th annual hamfest at New Columbia Hall, 86-41 122nd St., Richmond Hill, N. Y., on October 17, 1947, at 8 p.m. Admission will be $1.50 at the door, or $1 25 in advance, including tax. Tickets may be obtained from any of the clubs in the Federation, selected radio stores, and from Louis H. Roth, 163-18 Jamaica Ave., Jamaica, N. Y. Numerous prizes will be distributed and there will be non-professional entertainment.

•

You Can't Get It Out Of Your System

Max Haas, president of Bud Radio, Inc., recently went to the Mayo Clinic, Rochester, Minn. Following an operation on his arm he was placed in a two-bed room which had no other occupant. Two days later another patient was brought in, still unconscious following a back operation. All of a sudden the new occupant started to talk, while still under the effects of the anesthetic.

"Calling CQ, calling CQ," he said. "This is W6GS calling CQ." He then talked about his rig and station and repeated, "W6GS calling CQ."

Max Haas had been listening in wide-eyed surprise. At this point he leaned over and said, "Hello W6GS. This is W8VCC calling and returning. Come in W6GS." He no sooner finished than the man in the other bed awoke from his unconsciousness with a start and said, "W8VCC? I know that call. You're Max ----? Max ----?"

When he had fully recovered consciousness he gave his name as Clarence C. Brown, Bakersfield, Calif., and the two men discovered they had QSOd several times on the air.

■

N. E. Division Convention

The New England Division A.R.R.L. Convention and Tenth Annual Boston Hamfest, sponsored jointly by the Eastern Mass. Amateur Radio Assn. and the South Shore Amateur Radio Club, will be held at the Mechanics Building in Boston on October 18th. Special features will include interesting speakers, code and QSL contests, a banquet and many prizes. In addition, F.C.C. will hold amateur exams at 10 a.m. and 2 p.m.

•

Hudson Division Convention

Don't forget the Hudson Division A.R.R.L. Convention to be held in Asbury Park, N. J., September 26, 27 and 28, under the joint sponsorship of the Jersey Shore and the Monmouth County Amateur Radio Assns. This will be a mammoth affair with many technical talks, exhibition of equipment by manufacturers, a banquet, and numerous prizes including a complete deluxe ham station. There also will be many special activities for the YLs and XYLs.

■

Mobile Picnic

A "mobile" picnic is planned for October 5th at Devil's Backbone State Park near Manchester, Iowa, with all invited whether or not they possess mobile equipment. Each amateur should provide food for himself and family. A caravan of cars will leave Cedar Rapids at 10 a.m. on the 5th with radio equipment operating on 10 meters.

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formerly - - - ~~$99.50~~

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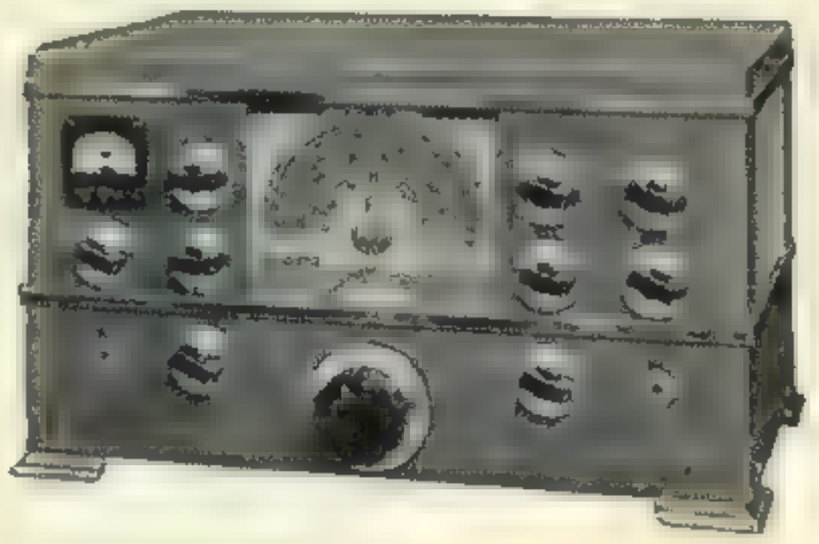
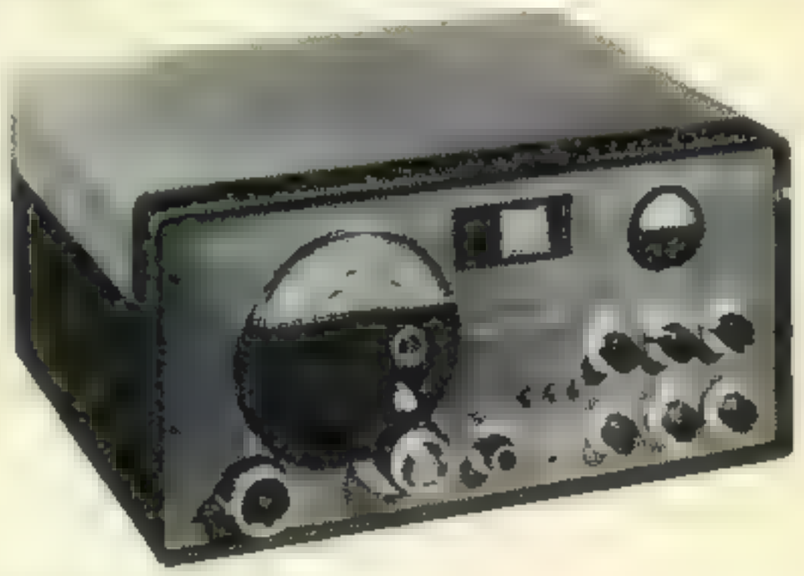


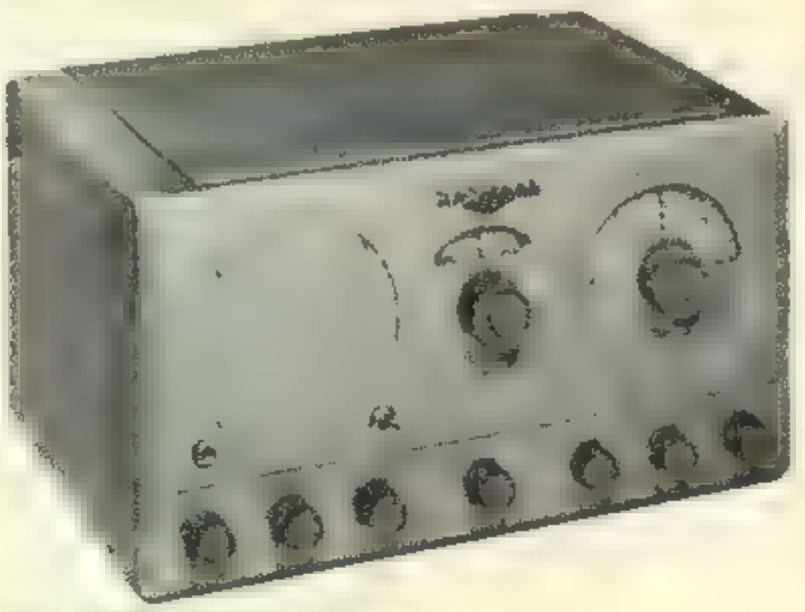
NATIONAL NC-2-40D
A twelve tube superhetrodyne covering a continuous frequency range from 490 to 30,000 Kc. Has six calibrated coil ranges, controlled by panel knob. Tuning control ratio: 60 to 1. Efficient design provides extreme stability. Signal to image ratio better than 30 db. at ten meters. Crystal filter on phone and CW. Eight watts audio output. Shipping weight 95 lbs.

C21261—Model NC-2-40D, Complete with tubes, Less speaker. **$225.00**
C21262—10" speaker in harmonizing cabinet **$16.44**



HALLICRAFTERS SX 42
Continuous frequency coverage—540 Kc to 110 Mc. AM reception over entire range; FM reception from 27 to 110 Mc. Bandspread tuning on 75, 40, 20, 10 and 6 meter amateur bands. Two stages tuned RF . . . 15 tubes in all. Employs new split stator tuning condenser on three higher frequency ranges for maximum gain. Has xtal filter, BFO and dual IF system (455 Kc and 10.7 Mc.) Matches any antenna. Audio output flat from 60-15,000 cycles . . . 8 watts undistorted. Matches 500 and 5,000 ohms.

C21070—SX 42, with tubes, less speaker and base. **$275.00**
C21072—R-42 Bass reflex speaker, table model **$29.50**

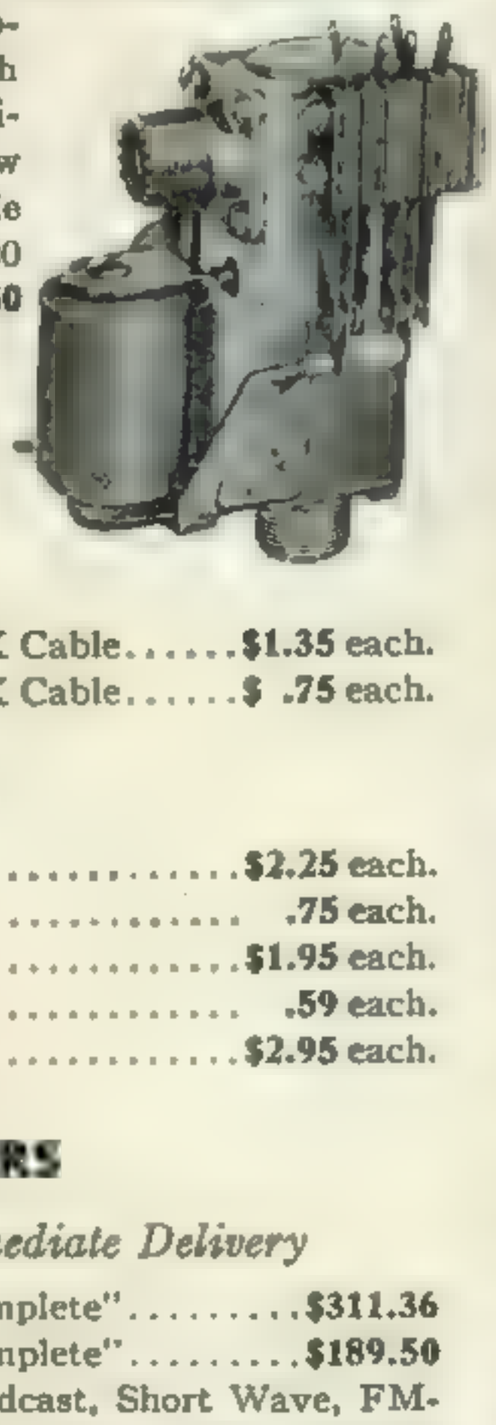


NATIONAL NC-57
Continuous coverage in five bands from 550 KC to 56 MC, with separate band-spread dial. Built-in speaker and power supply with voltage regulation for maximum stability on both CW and Phone. ANL, tone control, and separate RF and AF gain controls. Steel cabinet, metallic gray finish. For 105-120v, 50-60 cyc AC.

C21266—NC57—9 Tubes Your Cost **$89.50**

NEW COAXIAL ANTENNA RELAY

This relay—Advance Electric Type No. 7200 (AC)—8200 (DC) will eliminate loss in your coaxial transmission line. Relay uses Amphenol 83-1R receptacles, and is designed for use with 52 and 72 ohm line. Contact combination is single pole, double throw with a 10 amp. rating. Available from 1—220 Volt AC, or 1—220 Volt DC. **Price.....$7.50**



This unit is also available with auxiliary contacts in double pole, double throw with a 5 amp. rating. **Price.....$9.30**

51 ft. RG8/U Standard Br. CO-AX Cable.....$1.35 each.
26 ft. RG8/U Standard Br. CO-AX Cable.....$ .75 each.

TUBES

810 tubes (new), boxed.....$2.25 each.
6AK5 tubes (new), boxed..... .75 each.
811 tubes (new), boxed.....$1.95 each.
6AQ6 tubes (new), boxed..... .59 each.
829B/3E29 tubes (new), boxed.....$2.95 each.

RECEIVERS

Now in Stock for Immediate Delivery

NEW NATIONAL HRO-7 "Complete".....$311.36
NEW NATIONAL NC173 "Complete".....$189.50
S-47 Hallicrafters Standard Broadcast, Short Wave, FM-AM Receiver, Complete with push button FM assembly $202.50

GENERATOR

PE103A Generator, 6 or 12 volt, DC INPUT—OUTPUT 550 volts, 160 Ma. (New in sealed cartons).....$7.50 ea.

rices subject to change

All prices F.O.B. Los Angeles (California purchasers add 2½% sales tax). Include 25% with order — balance on delivery. Foreign orders cash

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IN RADIO SINCE 1926

RADIO PRODUCTS SALES INC.
1501 South Hill Street - Los Angeles 15, Calif
Phone: PR. 7471 - Cable Address: RAPRODCO

REGENERATIVE RECEIVER

(from page 41)

COIL TABLE

Coil A 3-6 mc: Grid Coil 36 Turns No. 22 enamel close wound. Tickler 14 turns No. 30 DCC close wound and spaced 1/8" from ground end of grid coil

Coil B 6-12 mc: Grid Coil 17 turns No. 22 enamel spaced to 1" length.
Tickler 9 turns No. 30 DCC close wound and spaced 1/8" from ground end of grid coil

Coil C 12-20 mc: Grid Coil 9 Turns No. 22 enamel spaced to 1" length.
Tickler 6 turns No. 30 DCC close wound and spaced 1/8" from ground end of grid coil.

All coils are wound on 2½" lengths of 1" dia. bakelite tubing. All coils are wound in the same direction. After winding, they should be liberally coated with coil-dope.

Key Clicks

In "The Cathode Follower V.F.O." appearing in September CQ there is an error in the description of the oscillator adjustment on page 82. In describing the final adjustment of the feedback condenser, *Cf, minimum* shift of the oscillator frequency is desired, not maximum as is now called for.

●

The Way To a Man's Heart is Through His Stomach!

Celebrating the 35th anniversary of his entrance in the amateur radio field, Harry Cohen, owner of Hershel Radio Company of Detroit, is staging a tremendous sale of radio and electronic equipment. But in addition to offering a mammoth stock of radio equipment, Harry is giving a special gift for the YL or XYL. An 8-piece Glasbake casserole gift set is being shipped during the anniversary sale as a gift with every order over five dollars. The strategy could only be conceived by an old-time ham who has found the solution to the problem of how to get "uninterrupted" time to work with the gear. Put the little women in the kitchen and have her use the new kitchen wear to turn out some cullinary art . . . while the OM puts together the rig.

DEPENDABLE EQUIPMENT "Communications" GUARANTEED EQUIPMENT

Transformers

All Primaries 117V 60cy

5084-1000V CT 250ma, 6.3V 1.5A. 6.95
5190-6180V 200ma 14.75
5057-6.3 VCT1A, 5VCT3A, 5VCT3A. 2.75
5104-V-6.3 1A, 6.3 1A, 6.3 1A. 2.45
5126-5VCT3A, 5VCT3A, 5VCT6A 3.25

Rectifier Transformer: 117VAC input, 62V output at 3.5A. Rectify and use with filter and rheostat to run your 6, 12, & 24VDC epuipment. 1.50

Power Pair: Xfmr 470VCT 60ma, 6.3V 1.65A, 5V 2A, primary 115VAC 50 to 1500cps PLUS a 6hy 50ma choke to match 1.99

Chokes

8.5hy 125ma 1780V test. 1.45
Dual: 7.5hy 75ma 11hy 60ma. 1.95
Dual: 2hy 100ma 2"x2"x3". 85

RCA 12 Tube Superhet

100 to 1500KC. 115V operation Dim: 24"x18"x13". Used: in excellent condition guaranteed. $29.95

Microwave Tubes

MAGNETRONS

3J31 (1cm). $17.50
Magnet for 3J31 . . . . . 8.00
2J26 (10cm). 25.00
2J32 (10cm). 25.00
2J38 (10cm) with magnet 37.50
WE700A (L Band). 35.00
WE720BY (S band). . . . 25.00

We have a microwave part to suit every need—send for flyer or information.

Cathode Ray Tubes

3BP1. . . . . $3.95
3FP7. . . . . 2.98
5BP1. . . . . 4.95
5CP1. . . . . $4.95

Nominal 75 Watts Output

The famous BC 191-375 transmitters freq. range of 1.5 to 18mc CW and Phonell With one tuning unit supplied closest to freq. specified available at time of shipment. In excellent used condition. $9.95

Tuning Units

From BC191 & 375 transmitters. Contains coils, chokes, dials, condensers. Freq. range from 375kc to 12.5mc. Will supply closest to freq. requested available at time of shipment. Only. $2.75

From TCE & GP-7. Ideal basis for ECO rig. Ranges: A 350-800kc, B 800-1500kc, C 1.5-3mc, E 4.525-6.5mc, F 6.2-9.05mc,
Complete set of 5. . . . . $11.00
Units C or F. Each. 2.75
Units A,B,E. Each. 2.00

Mobile Power Units

DYNAMOTORS

BD-77: used with BC191 In 14vdc Out 1000vdc 350ma $5.95
DM-21:14vdc In 235vdc 90ma Out. 2.59
DM-25: 12vdc In 250vdc 50 ma Out . . . 2.49
DM-34: 14vdc In 220vdc 80ma Out. 2.49
DM-42: 14vdc in 515/1030vdc 215/260ma & 2/8vdc 3.95

Hand Generators

GN-35: output 325-365vdc 100ma, 8vdc 2.5A or 380-420vdc 70ma, 10vdc 1.25A New $4.50, Used $3.50

Cross Pointer Indicator

Two 0-200 microampere movements, 3"case, many applications. $1.89

Coax Cable & Plugs

RG9/U 51 ohm silver coated. Min 50 ft. length . . . . . per ft. .07½
RG8/U 52 ohm. Min 40 ft. length. . . per ft. .07½

Amphenol Low-Loss Series Connectors

83-1SP Male. 27c
83-1SPN Male. 27c
83-1R.Female 27c
83-1AP Rt. angle. 27c
83-1F Junction 45c

Flyweight Transmitter

T49A/AMT-1 complete 72.1MC xmtr using 3A5. 4"x3"x6". Complete with tube. $2.95

Relays

SPDT 5 VDC in can 5 pr base. . . . . $.85
DPDT 6 VAC Struthers Dunn. 1.45
DPST 6 VAC Struthers Dunn. 1.35
2 sect SPDT 6VAC Wheelock type 1.10
SPDT 115 5VAC Leach 1.00
SPDT 115 5VAC WE Wheelock type 1.26
SPDT 115 5VAC Kurman latch 2.49
SPDT 115 5VAC GE with SPST Thermal delay section. $1.95
DPST 24 VDC Allied 75
DPDT Leach ANT with SPST rec sect 24DC & 12 DC. 1.25
4PDT 24VDC GM. 85
Solenoid Contactor 24 VDC Leach. 1.05
Thermal Delay 45-60 sec Edison 1503 w 4pr base. $2.95

Leach DPDT Ceramic ant changeover relay 160 ohm coil. Plate current of 140 ma will close. Use in B-lead.
Each $1.25

Headgear Dynamic Mike and Headset Combination, soundpowered. No. batt. required. Mike and earphones. Complete. $2.75
New, U.S.Air Corps insert type HS30, comfortable, lightweight, efficient 500 ohms. 85
Output trans to match 500 to 8000 ohms. 35

SPECIALS

Vibrator Transformer—Primary: 6, 12 and 24V; secondaries: (2) 120V @ 15ma. (1) 11V. Dimensions: 3.25"x3"x3". $1.00

Feed Thru Insulator—3" cupped shaped pair with flexible whip ant. mtg. Can be used either for feed thru or as whip and mast base. $1.50

Antenna Grounding Switch—A MUST FOR EVERY SHACK. Rated 100 amps 2500 volts Silver ball contacts. 1.98

Selsyns—Type 5G 115V, 60C AC Dim: 3¼"x5½". Special: a pair. $7.75

Toggle sw—4PDT, bat handle. . .69

AN/PRS-1 Mine Detectors

New and complete for detection of both metalic and non-metalic materials hidden underground. Includes earphones, speaker, amplifier, spare tubes. Another "Communications" buy. . $12.75
With batteries. 20.75

Condensers

GE-Sprague-Aerovox-CD

1 mf 300 vdc.	$ .20	.1&5 mf 2000 vdc	1.25
2 mf 300 vdc.	.25	10 mf 600 vdc. .	.85
4 mf 300 vdc.	.30	1 mf 1000 vdc. .	.75
4 mf 400 vdc.	.50	.1 mf 1000 vdc. .	.25
5-5 mf 400 vdc. .	1.05	2 mf 1000 vdc. .	.89
1 mf 500 vdc GE.	.25	4 mf 1000 vdc. .	1.00
2 mf 550 vdc.	.25	10 mf 1000 vdc. .	1.40
.25 mf 600 vdc. .	.20	1 mf 1500 vdc. .	.95
.85 mf 600 vdc. .	.25	.4 mf 1500 vdc. .	.15
1 mf 600 vdc. . . .	.30	2 mf 660 ac/1000	.85
.1-.1 mf 7000 vdc	2.00	1 mf 2000 vdc. .	1.00
In lots of 50. . .	1.50	1 mf 3000 vdc. .	4.95
8-8-4 mf 650v. .	1.45	1 mf 7500 vdc. .	12.50
2 mf 600 vdc. . .	.35	.25 mf 20,000 vdc	17.50
4 mf 600 vdc. . . .	.60	.25 mf 1000 vdc. .	1.25
6 sect. ceramic stack variable 35-460 mmf 500v	1.79	1.5 mf 6000 vdc.	12.50
		4 mf, 50 WVDC.	.49

154-186MC Transceiver RC-145

Complete 117vac power supply. 1kw pulse modulated output can be converted to CW or voice operation. Plenty of room in xmtr for changes. Comes complete with selsyn beam direction indicator, blower, rack Dim: 40"H 27"W 21"D $200
RC-148: consists only of transceiver and AC power supply. In used but excellent condition. With tubes. $47.50

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MILLEN No. 90810

"10-11, 6 and 2" Meter Band

CRYSTAL CONTROLLED TRANSMITTER

The No. 90810 consists of a Bliley CCO-2A crystal oscillator unit, using a 6AG7 crystal oscillator, a 2E26 tripler and an 829B power amplifier stage. For 10 meter operation, a conventional crystal is used, the crystal unit driving the 829B direct. For 6 meter operation, an overtone crystal is used in the crystal stage and drives the 829 directly as a power amplifier. For 2 meter operation, the overtone crystal is likewise used, but the output from the crystal unit is fed through the 2E26 tripler.

The No. 90810 with 10 meter coils but less tubes and crystal, net.....**$69.75**

Ham Radio Suppliers since 1919

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963 LIBERTY AVE., PITTSBURGH 22, PA.

V.H.F.—U.H.F.

(from page 52)

check on this also and if anything develops will bring it to you in the column. We just ain't a'gonna say it didn't happen, as other rumours we can't mention because of security reasons may become public sometime and—well we don't like to blush.

W9AB in Mishawaka, Ind. says that there was good inversion or ducting on July 28th, Aug. 3 and Aug. 5th, not mentioning what came through. There are 5 active stations on in South Bend and all xtal controlled and beam antennas, one being 16 elements.

Aug. 8th was good, as mentioned at the start of the column, for W9ALU in Metamora, Ill., who heard several dozen Chicago stations, W8CVQ and WØHAQ. He was unable to hear W3GV, though W3GV was heard at W9ZHB.

W6WNN in La Mesa, Calif. says that he has a 522 on 147 mc and a lighthouse tube receiver on 235 mc.

From W1JFF, Newport, R. I., we learn of the Rhode Island gang's success on the band. The gang there includes, W1KLR on 145 mc with 45 watts, 6-element beam and FM-AM super. W1LPO on 146 mc uses an ARC-5, 6-element beam and 10-tube FM-AM super. W1JFF on 146.6 mc with 60 watts to an 815, has a 6-element beam and 12-tube super. W1HXS has 100 watts to PP HK-24Gs on 146.8 mc. W1BJE on 147 mc, has 100 watts, superhet receiver and 6-element beam.

W1LKH operates on 144.2 mc, using 80 watts to an 829B, superhet and 48 element beam! W1EZW on 147.6 mc, uses 80 watts to 829, 1068A receiver and 6-element beam. W1BBA on 145 mc has an ARC-5 and VHF-152 receiver. W1UA, MOPA 829 on 144.7 mc, and a superhet receiver and W1-BLS, 146.9 mc, MOPA, and 6-element beam comprise the remainder of the gang.

Distances possible from Newport, R. I. are 200-250 miles and more, due to the gradual sloping ground to the sea. The best shot is over the water to Long Island, N. Y. C. and New Jersey. Inversions frequently happen and on sked from W1JFF to W2NGA at New York City, he was worked 5 nights out of 7 in one week and 6 nights the following week. This was under varying conditions, the band being poor some of the nights. All stations were using vertical antennas. W1BDF at Nantucket Is., Mass., worked VE3BLZ in Nova Scotia on July 26th as well as some of the others on Cape Cod. Fred wants to stress the fact that beams, xtal control and superhet converters or receivers all go together to make a 2-meter set up that will go places.

SK

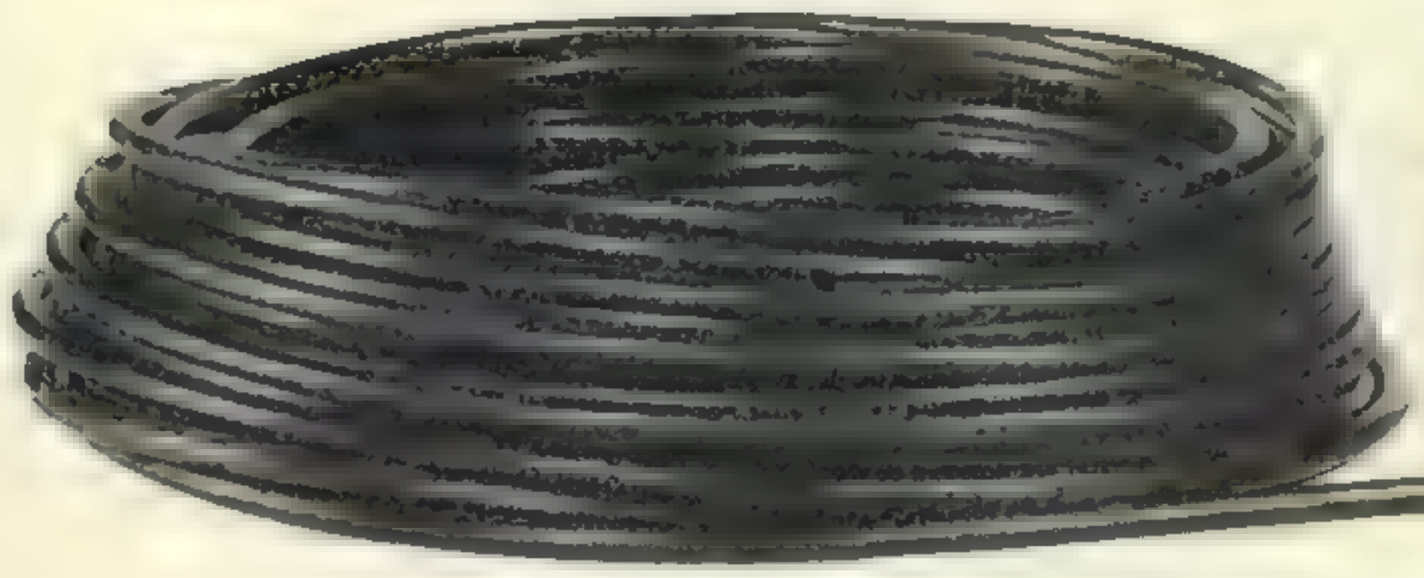
Well this is it. You fellows on 144 mc have the column available to report your inversion or ducting work, so let us hear from you. We would be glad to report the openings, as we do on 50-mc skip if we know of them. Drop us a line please, and give the boys around the country a picture of what takes place on the band.

●

New 816 Ratings

RCA engineers have approved a peak inverse rating of 7500 volts for the RCA-816 rectifier tubes. This means that the tubes will operate well within their ratings when used with standard plate transformers having 5000-volt center-tapped secondaries. With average quality components in a choke-input circuit, 250 ma at about 2150 volts can be taken from the output of the filter following a full wave rectifier.

IT'S *Wells* FOR COAXIAL CABLE and CONNECTORS



We have many types of coaxial cable in stock available for immediate delivery. It is all of the highest quality, government inspected material and is attractively priced. Popular RG8U 52 ohm cable only $2.95 per hundred feet.

All standard and British type connectors are carried in stocks adequate for the largest users. Most single contact connectors priced at only 40c each. Most twin contact connectors are 45c each. Send us your requirements or write for coaxial cable and connector listing 100A.

Our inventory of radio-electronic components is one of the world's largest. Write for special listings on relays, wire wound resistors, volume controls, wafer switches, micro-switches, transmitting tubes, mica and silver mica condensers, transmitting tubes, tube sockets, terminal strips, transmitting capacitors, oil filled paper condensers, wire, and Amateur Catalog H200B.

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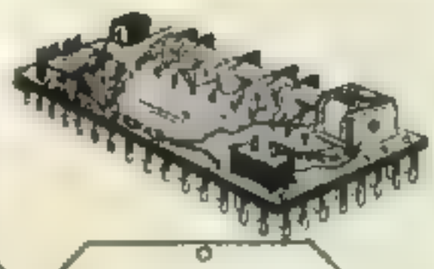
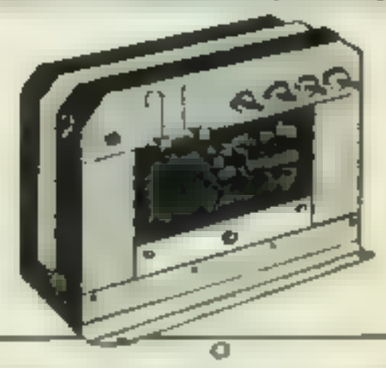
MAKE YOUR YL OR XYL HAPPY—THIS BEAUTIFUL 8 Pc. CASSEROLE SET FREE WITH EVERY PURCHASE OF $5.00 OR MORE—This Offer Good For a Limited Time Only

Genuine GLASBAKE~ *Endorsed by Good Housekeeping.*





Brand New Automatic Direction Finder

RADIO COMPASS

SCR-269 F COMPLETE WITH COMPONENT PARTS **$75.00** NO. OT-100

The radio compass SCR-269-F was designed to be the primary radio navigation compass for the United States Army and Navy Air Forces. Constant reception is possible day or night so that fixes can always be made to establish the plane's or ship's location

Plotting fixes is accomplished by selecting two or more stations and plotting these on the navigation map. The point of intersection of these lines indicates the location of the craft.

This equipment comes complete with 17 tubes superheterodyne receiver which is tunable from 200-1750 KC in three bands. A complete instruction book for operation and maintenance accompanies this equipment.

NEW BC-223AX TRANSMITTER

$14.95 NO. OT-109

Complete with tubes and tuning unit covering 80 meter Ham band including frequencies charts, less Xtals

BK22K Relay

$2.95 NO. OT-110

Used in conjunction with SCR269F changeover contains 29V step relay 5 deck 6 position switch 12V D P S T

1KW MODULATION TRANSFORMER

$14.95 NO. OT-111

RCA Mod Trans recommended rated at 550 Watt audio to modulate two 1KW rig Audio Watts—550 Sec 1— 650 Mils Sec 2 -80 Mils Tones Bank—Pri Sec 3.1 x Pri Sec 3 Taps—3.5 Impedance Ratio—Pri 4.1 Sec Pri Sec 2.33 Pri Sec 2 Taps—625 DC Resistance—Pri 125 ohms Sec 1 19 ohms Sec 2 99 ohms Transformers insulation tested for 5000 V Sec 1 1-3000V Sec 2-3000V to the rest of the coils and core Primary center tapped for Class B modulation Secondary 3 coils carry 80 Mils to modulate carriers of power tubes or screen grid tubes Primary will match any Class B tubes up to 10,000 ohms plate to plate such as 810's 781's 805's ZB 30's 203's HY51's 833's 878's 833's 3032's Size 9½ wide 7½ deep 7½ high Heavy channel iron mounting brackets Weight approx 40 lbs

EXTRA SPECIAL!

R.L.T. Tube Tester

$39.95 NO. OT-108

Tests all tubes up to 117 V

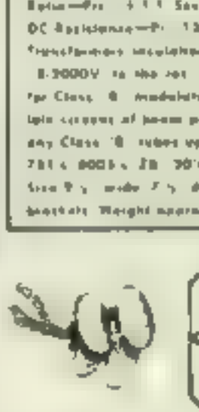
Tests shorts and leakages

Tests individual sections

Works on 90-125 V 60 cycle AC

Comes in portable cabinet complete with all operating instructions

BUY FROM HERSHEL & SAVE!

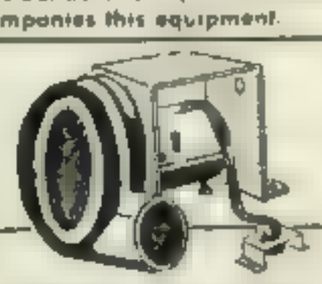


CORONA BALLS

Grid and plate connections for VT 127 250 TH etc Round Ball type heat dissipating silver plated **10¢** DT-116 **1.00 Doz**

VARIABLE CONDENSER

6 Gang silver plated, Sec 1 350 M.M.F.D, Sec 2, 3, 4, 5, 60 M.M.F.D., Sec 6, 80 M.M.F.D. **89¢** NO. OT-101



SQUIRRELCAGE BLOWER

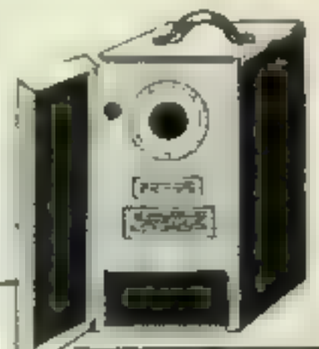
2" outlet, 110AC, 60cy Silent Ball Bearing Motor, with mounting bracket **$7.95** NO. OT-104

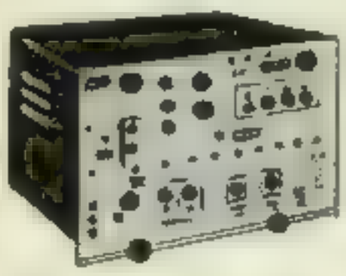
ARR7 Air Borne

VERSION OF HALLICRAFTER SX28A

129.00 NO. OT-112

With 3 RF stages and 6 calibrated superheterodyne 12 tubes Manual and manual tuning 3 meter 9 calibrated control crystal filter AVC phasing control ANL on-off switch provides audio output for speaker and phonograph output for recording Complete with tubes and R4 but without power supply Power requirements 270v at 135 ma New in sealed crate





BN IFF TRANSMITTER & RECEIVER

$9.95 NO. OT-102

Widely used on 144MC and now also successfully used as a television receiver, this being made possible by the wide band 30 MC I.F. channel and video amplifier being sold at this exceptionally low price for the encouragement of television. Original diagram furnished. Less tubes and power transformer, wt. 100 lbs

FILAMENT TRANSFORMERS

110-V, 60 cy. Pri. sec.—5V—3A. Shelled Case..... **$1.49** NO. OT-102

110-V, 60 cy Sec. 2.5V at 5.25 amps Shelled Case **$2.45** NO. OT-103

110-V 60 cy. Sec 1 5V at 10 amps Sec 2, 5V at 10 amps. Connected in series will give 10V at 10 amps. Shelled Case **$3.95** NO. OT-106

SECONDARY FREQUENCY STANDARD

$29.50 NO. OT 107

Complete with spare tubes 1000 KC to 45 000 KC 1000— 100— 10KC

Check points 100 to 250 V., 25-60 cycles

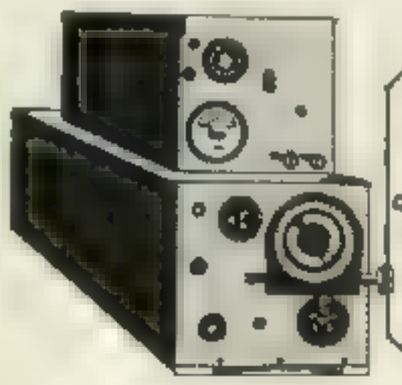
FREQUENCY METER BC-439

$24.50 NO OT-113

Xtal controlled check points Frequency range 100 MC 120 MC including 5 tubes and Xtals Operates from 110 V 60 Cyl supply Ideal precision instrument for high frequency measurement Used in good condition

IF TRANSFORMER

mounted in aluminum shield can. 1500 KC with air trimmer impedance coupled type **95¢** NO OT 115



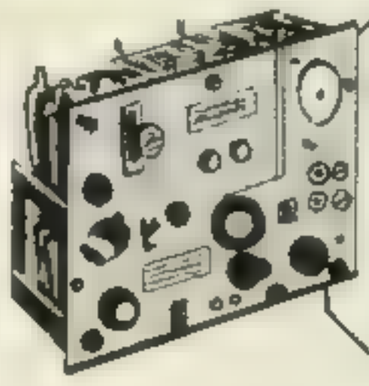
BC-AR230 Transmitter

Including 4 tubes and RF Amps. meter

BC-AL229 Receiver

Including 6 tubes. Used in aircraft.

BOTH UNITS FOR ONLY **$9.95** NO. OT-105



BC-654-A PORTABLE RECEIVER-TRANSMITTER

$12.50 NO. OT-114

The frequency range of both transmitter and receiver is continuous from 3700 to 5800 k cycles all stages gang tuned by anti-backlash worm gear dial mechanisms

The BC-654-A is 18 wide 14 high and 9½ deep Weight 44½ pounds Power required for Receiver—1.5 45 and 90 volts D C Power required for Transmitter—1½ & 51 84 volts D C and 500 volts D C at 60 Ma Operates from Dynamotor PE 103 A Complete with carrying case

CERAMIC INSULATORS

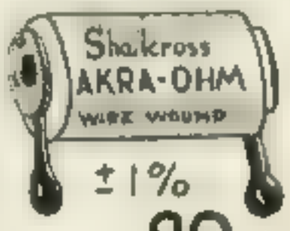
$1.00 DOZ.

NO OT-103 HIGH VOLTAGE FEED THRU

Scope Transformer

$3.95 NO. OT-104

110V Pri: 60 cy, Sec: 4000 V at 10MA Size 6 x 4 x 3½



Shakross AKRA-OHM

WIRE WOUND

±1%

1 MEG **89¢** NO. OT-105

SOCKETS FOR ACORN TUBES	NO. OT-117	$ .19
POWDERED IRON 3/8 SLUG	NO. OT-118	.10
JACKS-PL55, PL68	NO. OT-119	.15
ASS'T. MICA CONDENSER per 100	NO. OT-120	1.95
3 LBS. ASST. HARDWARE	NO. OT-121	1.00
PIN STRAIGHTENER for min. tubes	NO. OT-123	.49
VARIAC 1 AMP.	NO. OT-123	3.95
EAR PHONES, 2000 OHMS, used.	NO. OT 124	.95
JOHNSON SOCKETS #210-25 W...	NO. OT-125	.39
5V FILAMENT TRANS. 60 AMP...	NO. OT-126	5.95
SCR 625 MINE DETECTOR	NO. OT-127	49.50

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All Orders F.O.B. Detroit—Minimum order $2.00—Mich Customers add 3% tax.

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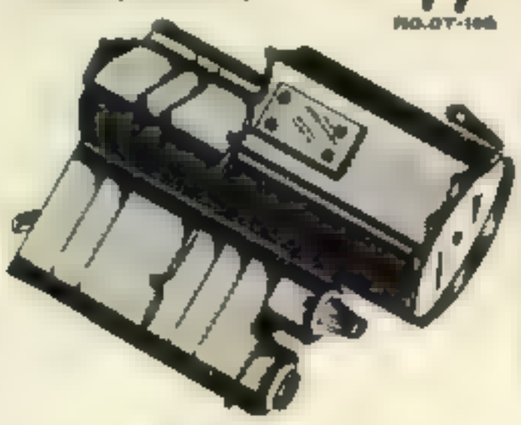
WITH EVERY ORDER OF $5.00 OR MORE
- WITH COUPON ONLY -

Genuine 8pc. GLASBAKE Ovenware Set for the YL or XYL.

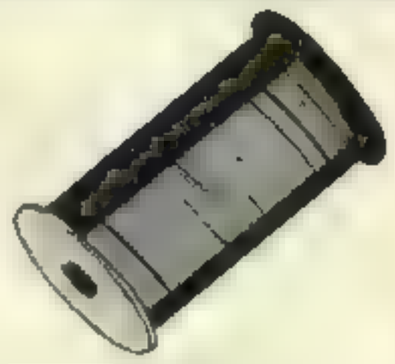
HERSHELS GIFT TO THE RADIO WIDOW!

MICA CAPACITATOR .002MFD, 3000 VDC **49¢** NO.OT-106

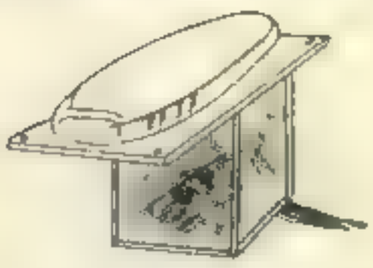


SNIPERSCOPE INFRA-RED DETECTOR $100.00 NO.OT-133

This sensational sniperscope that was so widely used in World War II, to combat the enemy in night warfare, is now, for the first time, being released. This unit comes complete and ready to operate from 110V, A.C. or D.C. source—this being made possible by the use of the following tubes: 1G54—117N7—1P25 image tube. Rubberized carrying case included.



COPPERWELD #18 WIRE 3000 FEET **$2.95** NO.OT-135



HIGH SPEED PHOTO FLASH TUBE $8.95 NO.OT-156

12,000,000 lumens light output. Stops all action. Ignition coil included on back of bulb. 10,000 flashes. Diagrams furnished.

PYRANOL CAPACITATOR $2.95 NO.OT 132

General Elect 1 MFD 5,000 VDC, 4 x 4½" x 3¾

POWER TRANSFORMER $1.95 NO OT 134

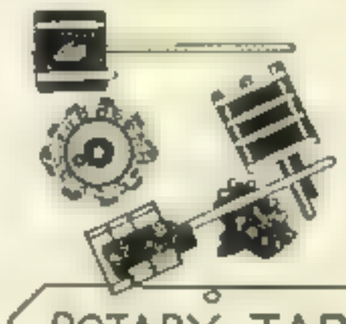
primary 110V 60 Cy Sec 700V each side of center at 80 MA 6.3V at 1.2 Amps 5V at 3 Amps Hermetically sealed size 6 x 3½ x 3

POWER TRANSFORMER $1.95 NO.OT 144

110V, 60 Cy. Sec 300V ea. side of center at 125MA, 6.3V at 2.1 Amps, 5V at 3 Amps., Hermetically sealed, size 6" x 3½" x 4¼

POWER TRANSFORMER $1.95 NO.OT 145

1.9V 60 Cy Sec 1.4V at 18 Amps Sec 2 2.5V at 1.75 Amps (Ideal for 2x2 and 826 tubes. Hermetically sealed size 6 x 3½ x 4¼



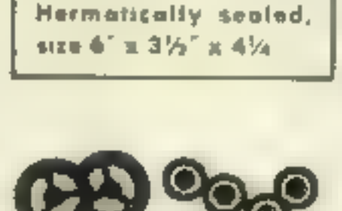
ROTARY TAP SWITCHES KIT OF 6 SWITCHES **$1.85** NO.OT 154

BUTTERFLY CONDENSERS

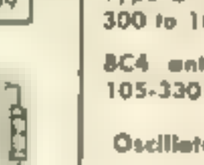
Oscillator assembly 76 to 300 MC with beam tube socket mounted on condenser	1.95
Type B—frequency range 300 to 1000 megacycles	95¢
BC4 antenna condenser. 105-330 MC.	1.95
Oscillator 105-330 MC.	1.95

LIP MIKE WITH HEAD BAND AND CORD **95¢** NO OT 131

1 POUND SOLDER 60/40 ROSIN CORE **50¢** NO OT 35



RESONANCE INDICATOR with neon bulb and alligator clip **19¢** NO OT 146



POWER TRANS. 110V 60 Cy Pri Sec 255V ea side of cente at 80 Ma 5V at 4 Amps 6.3V at 3.8 Amps Hermetically sealed case **$1.29** NO OT 65

30 MC IF TRANSFORMER NO OT-157 **29¢** SLUGGED TUNE

250 MFD AT 10V ROUND CAN 5/8 x 2" **14¢** NO.OT-30

MATCHING TRANSFORMER 69¢ NO OT 136

300 Ohms to grid hermetically sealed

COMPLETE HALLICRAFTER KNOB SET FOR SX28 95¢ NO OT-143

SHORTING TYPE INTERLOCKING MALE AND FEMALE **12¢** NO OT 129

VARIABLE RESISTOR 2500 OHM 100 WT **49¢** NO OT 142

IRC TYPE HE 49¢ NO OT 147

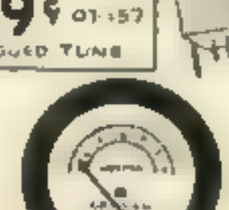
100W bleeder consisting of 5 sections 750 Ohms 23 Ohms 23 Ohms 7,500 Ohms 3,000 Ohms Total 11,296 Ohms

THORDARSON CHOKE $1.85 NO OT 152

at 200MA Shell cased

OVERLOAD RELAYS $1.95 NO OT-161

Potter and Brumfield Relay 1,500 Ohms Coil Current 10 MA Relay 2 110V 60 Cy AC coil SPDT



GENERAL ELECTRIC METER $3.95 NO OT-158

type D041, 0-1 MA, meter scale graduation 0-5 D.C. Kilo V and 0-10 MA D.C.

TUBES

813	5.95	872A	1.95
VR150	.89	9004	.65
955	.65	9006	.89
9002	.89	5085	.89
6J6	.95	829	2.95
RK60	.95	VT127A	2.95
9001	.89	35W4	.69
6J4	1.50	3AP1	2.95
5FP7	2.95	3BP1	2.95
7BP7	3.95	6J5	.49
9LP7	4.95	5BP1	3.95
6N7	.89	6H6	.59
1T4 — 3Q4—		6SN7	.59
3S4—5W4			
6SA7 5J4			59¢ ea
12H6—1G5			
6SH7			65¢ ea

PAPER COND. 9¢ NO OT-138

.05-.05-.05, 300 VDC, in round can. Approx 1 x 1"

VOLTAGE REGULATOR 95¢

Carbon pile stabilizer type pri current 10.5 Ma and Max 5 Amps at 8.25V

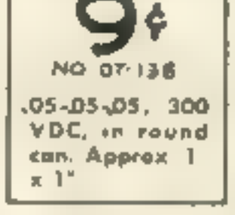
Transformer 95¢ NO OT 148

Audio osc transformer with output and feedback winding

TOGGLE SWITCH 39¢ NO OT 151

DPDT 30 Amps in black bake lite case

T17 CARBON MICROPHONE LIKE NEW **89¢** NO OT 160

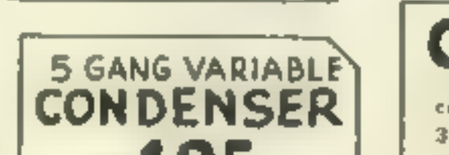


6 MH-500 MA 19¢ NO OT 39

For wound or shorted turns

ELECTROLYTIC Condenser 39¢ NO. OT-140

30MFD 150 WVDC round aluminum can plug-in type fits any octal socket



5 GANG VARIABLE CONDENSER $1.95 NO OT 149

5 Gang approx 50 M.M.F.D. per section with individual air-tuned padders 18 to 1 vernier drive

CHASSIS containing 110 AC relay 3 miniature sockets with tube shields 5 condensers and 6 res 3 x 5 x 1 **$1.95** NO OT 150

COLLINS FILTER CHOKE 6 MH 150 MA D.C. 190 Ohms Test V 2500 **1.69** OT 159

HERSHEL RADIO CO.

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All Orders F.O.B. Detroit—Minimum order $2.00—Mich. Customers add 3% tax.

HERSHEL RADIO CO. 5249 Grand River Avenue DETROIT 8, MICHIGAN

Please send me one 8 pc. casserole set FREE . . . For which I am enclosing an order for $5.00 or more on merchandise in this ad

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I understand that this offer may be withdrawn at any time. Sorry—offer good only in U. S. A.

PEERLESS PACKS Value PUNCH!

ECLIPSE cases, chassis, panels, and cabinets

. . . at prices that will astound you. Well-built, heavy gauge units that will provide years of rugged service.

STANDARD STEEL CASES

For housing monitors, oscillators, receivers, etc. Removable front and rear panels. Ruggedly constructed, yet light in overall weight. All seams and corners reinforced and spot welded. Black wrinkle finish.

Size	Price	Size	Price	Size	Price
2 x 4 x 4	$ .79	6 x 7 x 12	$2.06	7 x 8 x 10	$1.91
3 x 5 x 4	.84	7 x 9 x 15	2.82	8 x 10 x 10	2.34
6 x 6 x 6	1.06	5 x 6 x 9	1.39	8 x 11 x 12	2.56

STANDARD STEEL CHASSIS

CADMIUM or BLACK RIPPLE FINISH

Top quality standard steel chassis, stamped from **one piece** of cold-rolled steel. Four solid sides with welded corners. Bottom edges flanged on four sides to provide additional reinforcement. Please specify **Cadmium** or **Black Ripple.**

Size	Price	Size	Price	Size	Price
7 x 7 x 2	$ .79	10 x 12 x 3	$1.41	11 x 17 x 2*	$1.76
7 x 9 x 2	.88	10 x 14 x 3	1.44	11 x 17 x 3*	1.97
7 x 11 x 2	.94	8 x 17 x 2	1.41	13 x 17 x 2*	2.12
7 x 13 x 2	1.06	8 x 17 x 3	1.44	13 x 17 x 3*	2.41
4 x 17 x 3	1.09	10 x 17 x 3	1.47	13 x 17 x 4*	2.73
7 x 15 x 3	1.29	10 x 17 x 2	1.38	10 x 17 x 4*	2.03

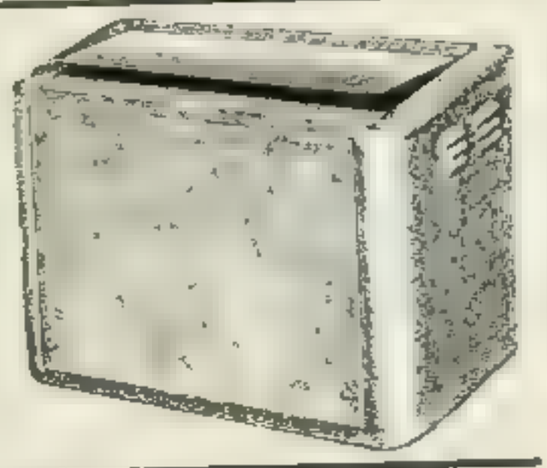
*18-gauge steel. All others 20-gauge.

ALUMINUM RACK PANELS

Fine, strong rack panels, made from 1/8" aluminum Uniformly slotted to fit any rack equipment having multiple 1¼"-½" spacings ("Western Electric spacing"). Black ripple finish.

Size	Price	Size	Price	Size	Price
1¾" x 19"	$ .94	8¾" x 19"	$2.44	15¾" x 19"	$4.64
3½" x 19"	1.34	10½" x 19"	3.12	17½" x 19"	4.97
5¼" x 19"	1.69	12¼" x 19"	3.67	19¼" x 19"	5.61
7" x 19"	1.99	14" x 19"	4.17	21" x 19"	6.58

STREAMLINED HINGED CABINETS



Front vertical corners streamlined. Evenly recessed hinged cover and removable front panel. Ventilating louvers side and back. Opening at rear for leads, cables, etc Finished in attractive grey ripple enamel.

Cabinet Size	Panel Size	Price	Cabinet Size	Panel Size	Price
8 x 10 x 8	8 x 8	$2.94	9 x 17 x 11	9 x 15	$5.88
8 x 12 x 8	8 x 10	3.23	12 x 20 x 12	12 x 18	7.06
8 x 16 x 8	8 x 14	4.26			

All prices F.O.B. Jamaica, N.Y. Please add postage. Write Dept. C

Write for special price list for: **Chassis Bottom Plates, Amplifier Foundations, Sloping Front Cabinets, Deluxe Streamlined Hinged Cabinets, and Hinged Standard Cabinets** . . . all at **Peerless**-low prices.

Peerless RADIO DISTRIBUTORS, INC.

92-32 MERRICK RD., JAMAICA 3, N.Y.

Branch: 71 Murray St., New York 7, N. Y.

DX

(from page 46)

equator. The island is an atoll about 28 miles around, and varies in width from 50′ to 500 yards. It surrounds a large lagoon which is about three miles wide at the widest point. Since it is in the dry belt, they have to distill all their water. He says the voltage regulation is very bad on the side of the island on which they live. This, of course, makes it rather hard on receiving and transmitting. On the other side of the island, however, where their regular station is located, they have good power regulation, but, at present, they have no quarters over there. Another ham active, this one on 20-meter phone, is *KH6KH/KB6* . . . he is ex-K6ETF. An interesting point which KB6AA relates is that Canton has a peculiarity in that signals get out O.K., but they have a tough time receiving. This is noticeable on their regular C.A.A. circuits too.

From what *KS4AC* says, the KS4s might become rare again in the near future. For some reason or another, they are going to lose their 20 and 40-meter rigs. Just what the score is, I don't know, but Grif says some way, some how they'll lash up something and get on the air.

W6BIL received a letter from *W2WMV/C9* who returned BIL's QSL card to *MX3KG*, which, in turn, was sent in care of *MX3KP*. The latter was O.K. but isn't in Mukden anymore. W2WMV/C9 says he is just as much in the dark as we are as to the whereabouts of the other MX's. Well, we have covered the 3KA and 2AG situation in other columns, so we won't go into that again.

W.A.Z. Honor Roll

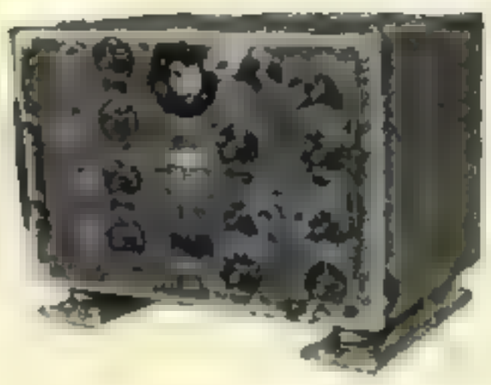
You boys will notice the axe has fallen on the Honor Roll. We have found it necessary to place a minimum limitation to those listed in the Honor Roll, effective with this issue. The minimum zone requirements for the Honor Roll will be 30 zones . . . no minimum, of course, on countries. The Honor Roll is growing by leaps and bounds. So fellows, for the time being, it's 30 zones or better, and this requirement will probably hold until such a time as we can't get any more on a single page.

Phone Gossip

W8LO is no more: his new call is W2ZW. New ones for Allan are *MD5DC*, *KG6AV/VK9*, *CT1UU*, *OE9AD*, and *EA9AI*. W9KYM dropped a line to me to say that he has been elected secretary of "QSL Braggers Club". He informs me of its high purposes and aims by saying it is limited to hams who have worked 25 countries or more, and after an intensive membership drive, they have nearly four members. He goes on to say that it has all the fraternal benefits except cheap insurance. I think it's the weather, but yet he says he snagged *VR6AA* and made a sked for brother W9WCE, who didn't work him the next day on 28 mc. Well, after wading through that bit of stuff, it must have been a hot day in South Bend, or it could have been that W9KYM was fresh out of shrimp and beer!

PY1JY is going to town since he put up his 3-element rotary, and on his first CQ with his new beam, he landed *VU2BD*. So far, he worked 29

'Hot Radio Values' at SUN RADIO . . .



100 WATT BENDIX TRANSMITTER TA12

Check These Values:

Three 807 Tubes, four 128K7, one 2 inch 5 amp. RF meter, four Separate Master oscillators. (These can be easily changed to cover 20-40-80 meters and by using crystal for the 10 meter band you will have a complete coverage transmitter.)

Four separate output tanks.

One 4 position selector channel switch having seven sections which changes the ECO, IPA and output tanks simultaneously. All the controls are mounted on the front panel. The housing is cast aluminum; shields and case are sheet aluminum. Dimensions 11 x 12 x 15 inches, weighing 35¼ lbs. Complete, simple instructions for conversion furnished. Complete with tubes.. **49.95**

SUPERHETERODYNE RECEIVER:

This crysta fixed frequency receiver comes with full conversion instruction for variable tuning of all ham bands and broadcast. A highly selective superheterodyne receiver, 110 V.A.C. power supply built in. Using the following tubes: 6K7-RF Amplifier; 6K8 Mixer and Oscillator; 6K7 F. Amplifier; 6F7;—Detector and A.V.C.;6C8 Output and Noise Suppressor; 80 Rectifier. Dimensions—3½ x 19 x 11½ inches. Comes complete, brand new, with one set of coils and two sets of tubes **16.95**

Extra set of coils $1.95

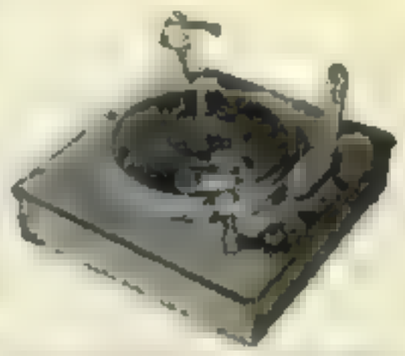
SPERRY AMPLIFIER $3.95

Brand new servo amplifier containing two beam power output tubes (1632) similar to 25L6, two twin triodes (1633 and 1634) similar to 65C7, two mica condensers, dozens of color coded half watt resistors, two dual and four section bathtub condensers, three transformers, two wafer switches, one volume control, four octal sockets. Easily convertible.

VM RECORD CHANGER

Brand New. Mixes 10 and 12" records **$16.95**

Wood Base for above **$3.49**



ALL BRAND NEW RADIO TUBES

Save up to 80%

All Standard Brands - in Cartons

Type	Price	Type	Price	Type	Price	Type	Price
*DZ4	1.10	6AQ5	.90	6Y6G	1.10	14H7	1.32
1ASGT	.75	6AQ7GT	1.10	7A4	.90	14Q7	1.10
1A7GT	.90	6AT6	.75	7A5	.90	14R7	1.10
1B5/25S	.90	6B4G	1.32	7A6	.90	24A	.67
1C5GT	.90	6B7	.90	7A7	.90	25L6GT	.75
1G4GT	.90	*6B8	1.32	7A8	.90	25Z5	.67
1H4G	.90	6BA6	.90	7B5	.90	25Z6GT	.67
1H5GT	.75	6BE6	.90	7B6	.90	26	.52
1L4	1.10	6C4	.75	7B7	.90	27	.47
1LA4	1.60	*6C5	.75	7B8	.90	30	.90
1LA6	1.60	6C6	.67	7C5	.90	32L7GT	1.60
1LB4	1.60	6C8G	1.10	7C6	.90	35/51	.67
1LC5	1.60	6D6	.67	7C6	.90	35A5	.90
1LC6	1.60	6D8G	1.10	7C7	.90	35B5	.90
1LD5	1.60	6E5	.75	7C8	.90	35L6GT	.67
1LH4	1.60	*6F6	.75	7E5	.90	35W4	.57
1LN5	1.60	6F8G	.90	7E6	.90	35Z3	.90
1N5GT	.90	6G6G	.90	7E7	1.10	35Z4GT	.55
1Q5GT	1.10	*6H6	.75	7F7	1.10	35Z5GT	.57
1R5	1.10	6J5GT	.62	7F8	1.32	36	.67
1S4	1.10	6J6	1.32	7G7/1232	1.32	37	.57
1S5	1.10	*6J7	.90	7H7	1.32	38	.75
1T4	1.10	6K5GT	.95	7J7	1.32	39/44	.67
1T5GT	1.10	6K6GT	.67	7K7	1.32	41	.57
1U4	.90	*6K7	.75	7L7	1.32	42	.57
1V	.62	6K8GT	.90	7N7	1.32	43	.90
2A3	1.32	6L5G	.75	7Q7	.90	45	.55
2A6	1.10	6L6G	1.32	7V7	1.60	45Z3	.75
3Q4	1.10	*6L7	1.10	7Y4	.90	45Z5GT	.75
3Q5GT	1.10	6N7GT	1.10	*12A6	1.32	46	1.10
3S4	1.10	6P5GT	.90	12A8GT	.67	47	.75
3V4	1.10	*6Q7	.90	12AT6	.75	50B5	.90
*5T4	1.32	*6R7	1.10	12BA6	.90	50L6GT	.75
5U4G	.67	6SA7GT	.75	12BE6	.90	50Y6GT	.75
5V4G	1.10	*6SB7Y	1.32	*12C8	1.32	53	1.10
5W4GT	.62	*6SC7	.90	*12H6	.75	55	.75
5X4G	.75	6SD7GT	1.32	12J5GT	.67	56	.55
5Y3GT	.47	6SF5GT	.90	12J7GT	.75	57	.62
5Y4G	.52	*6SF7	.90	12K7GT	.67	70L7GT	1.95
5Z3	.75	*6SG7	.90	*12K8	1.10	71A	.62
*5Z4	.90	6SH7GT	.90	12Q7GT	.62	75	.57
6A6	1.10	6SJ7GT	.75	12SA7GT	.90	76	.62
6A7	.67	6SK7GT	.75	*12SC7	.90	77	.62
*6A8G	.90	6SL7GT	1.10	12SF5GT	.75	78	.62
*6AB7/1853	1.32	6SN7GT	.90	*12SF7	.90	80	.47
6AC5GT	.90	6SQ7GT	.75	*12SG7	.90	81	1.32
*6AC7/1852	1.32	*6SR7	.75	*12SH7	.90	82	.90
6AD7G	1.10	*6SS7	.67	12SJ7GT	.75	83	.90
6AF6G	1.10	*6ST7	1.10	12SK7GT	.75	84/6Z4	.75
6AG5	1.60	6U5/6G5	.90	12SL7GT	1.10	85	.62
*6AG7	1.60	6U7G	.67	12SN7GT	.90	89	.27
6AK5	.90	*6V6	1.32	12SQ7GT	.75	117L7/M7GT	1.95
6AL5	.90	6V6GT	.75	*12SR7	.90	117N7GT	1.60
*METAL TYPES		6Y6GT	.67	12Z3	.57	117P7GT	1.60
				16A7 12R7	1.32	117Z6GT	1.10

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zones and 71 countries. Practically all of the DX for PY1JY is on 28 mc.

This month's bull session is of necessity a little short. This is due to getting away on that vacation which I mentioned last month. It works both ways: this will give you guys a vacation, too. When I come back again, I can start worrying about those W9s. Perhaps in the meantime the phone gang will get busy and shoot in some more stuff. 73.

QTH'S

C6HH	Box 2, Nankching, Shensi, China
C7FP	Box 52, Peiping, China
CR8AC	Box 4A Panjim Goa, Portuguese India
ET3Z	Box 1636, Addis Ababa, Ethiopa
EP2DS	Box 9, Jesd, Persia (Iran)
GD2FRV	Nelson Sherwood, Queens Promenade, Douglas, Isle of Man
HH2CL	Claude Lebreton, Rue Rigaud No. 55, Petiam-Ville, Haiti
HR1CE	Chan Ehrman, U. S. Embassy, Tegucigalpa, Honduras
HS1SS	Sgt. King, American Embassy, Bangkok, Siam
J9SIR	Via W8GER
KA1ABU	6 Domingo Santiago St., Manila, P. I.
KJ6AA	(ex-W9OTC/KJ6) Navy 311, c/o F. P. O. San Francisco
LU1ZA	Radio Club Argentino, Av. Alvear 2750, Buenos Aires
LX1AB	W. Berger, 20 Louvigny Str., Luxembourg (G.—D.) Europe
MB9AM	Via R.S.G.B.
MD1D	Via R.S.G.B.
MX3PA	Pfc. Matt J. Gaynor, Jr., RA 1324-9958, Hq. & Hq. Co., 63rd Inf. Regt. Carrier Det. Radio Bldg., APO 6, Unit 3, c/o P.M. San Francisco, California
OX3GD	C. G. Loran Radio Station, Frederiksdal, Greenland, c/o F.P.O. New York, New York
PK2ML	Maz R. Rommel. Corp. Tel, 18352, c/o O.A.Z. Semarang, Java
PK5LK	Via V.E.R.O.N., Postbox 400, Rotterdam
TA1AD	Box 100, Istambul
VK9OU	c/o Radio Station "9PA" Port Moresby
VQ5JTW	Government Radio Station, Entebbe, Uganda, Africa
VR6AA	Nelson Dyett, (ex-ZL2FR) Pitcairn Island, c/o P.M. General, Balboa, Canal Zone
VS6AY	c/o Hongkong Signal Coy, Hongkong, China
VS7DR	205 Squadron, R. A. F., Ceylon
VU2RW	Transmitting Station, R.A.F., Mauripur, Karachi, 13 Armed Forces, Pakistan
W8WEA/TRUK	Harry Phillips, Navy 3410, c/o F.P.O. San Francisco
WØTKK/VK9	338th Photo Recon. Sqdn., APO 246, Unit 2, c/o P.M. San Francisco
YO2F	Via R.S.G.B.
ZB1AF	R.A.F. Signals Unit, Malta
ZD1WB	Wm. Bonano, c/o Post Office, Freetown, Sierra Leone
ZD4AI	G.P.O. Accra, Gold Coast
ZE2JH	Box 659, Buluwayo, So. Rhodesia
ZM6AF	Box 90, Apia, British Samoa
ZS3D	Box 636, Windhoek, Southwest Africa

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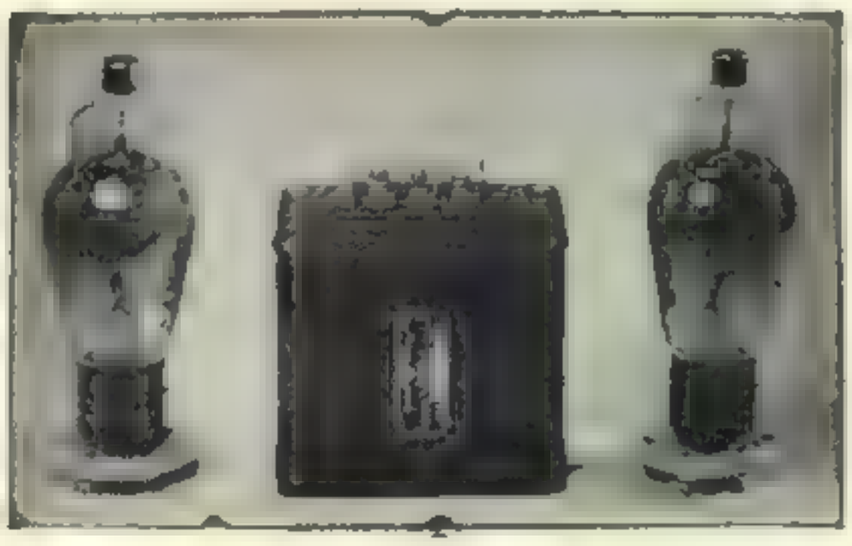

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This microphone will work into any 200 ohm impedance input circuit. Has adjustable strap to fit any neck. In operation this microphone is strapped around the throat thereby facilitating full freedom of both hands and head movement. Ideal for ultra high frequency mobile work for hams. Supplied with strap. 10' cord and plug. Can also be used as a hi-grade Carbon Mike by simply drilling three holes in case. Sensitivity of this mike equal to mikes costing $10 and $15.

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Your cost **49c**

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600 MILES ON 2!

(from page 24)

arrived. Thirty minutes later we were in QSO with W2HWX, an old standby on two meters, in Little Silver, N. J. There followed a short QSO with W2VPY on Long Island and then we heard our old friend W2DFV, in Raritan Township, N. J., calling us. This QSO was getting us close to our goal as it was about ten miles farther than the previous record and for about ten minutes Harold held one end of a new record. This did not last very long for as we signed we heard an i-c-w signal calling us and this turned out to be W2REB, in Grenloch Terrace, N. J., about 15 miles south of Camden. This put the record up in the 500 mile category and by that time we were all fit to be tied for the band was wide open and signals were rolling in from the second and third districts. There followed a few QSOs with stations in the Long Island area and finally we worked W2RH, in Westchester, N. Y.

Ken informed us that many stations were calling and offered to aid us in extending the record if he could. As we tuned the band we were to listen on his frequency for a call if he had any information.

The next thing was another call from W2RH with Ken informing us that stations in D.C. were calling us.

With the b.f.o. on we carefully tuned the band and found a c-w signal calling us in the mess of heterodynes. It turned out to be W3KUX in Washington, D. C.! We stayed in contact long enough to enable all three stations to work him for a joint record. Then we started to listen for W4FJ in Richmond, Va., who was supposed to be calling us. The QRM was so terrific that we didn't hear him although W2RH told us that he was in there calling us.

The next QSO was with W3EIM in Baltimore, Md., followed by QSOs with a number of 1st and 2nd district stations. The last long jump was made to W3EPN in Philly with the sign off at 12:55 a.m. on August 7th. This was the end of the really long jump contacts and we followed the band closing as the gang in S. N. J., Md., and Pa., went out. Finally the W2s started to go out and the W1s were left to work. The last contact was with W2LKN in Elizabeth, N. J., as his signals came up with a last minor opening of the band. Finally there was complete quiet and we started to close station.

In Retrospect

The use of straight c.w. is something that should be stressed and a b.f.o. should be included in all 2-meter receivers. It will pay off—the QSO with W3KUX would not have been possible for us if he had not had c.w. available. There were also other QSOs that would have been better if the stations involved had been set up for c.w. When signals faded down into the noise level and we couldn't copy fone or i.c.w. we could hear the station's carrier with the b.f.o. on and a 100% c-w QSO would have been possible.

We estimate that at the peak of the band opening there were about 200 stations present we could de-

(Continued on page 72)

DX HANDBOOK

15 Chapters include:

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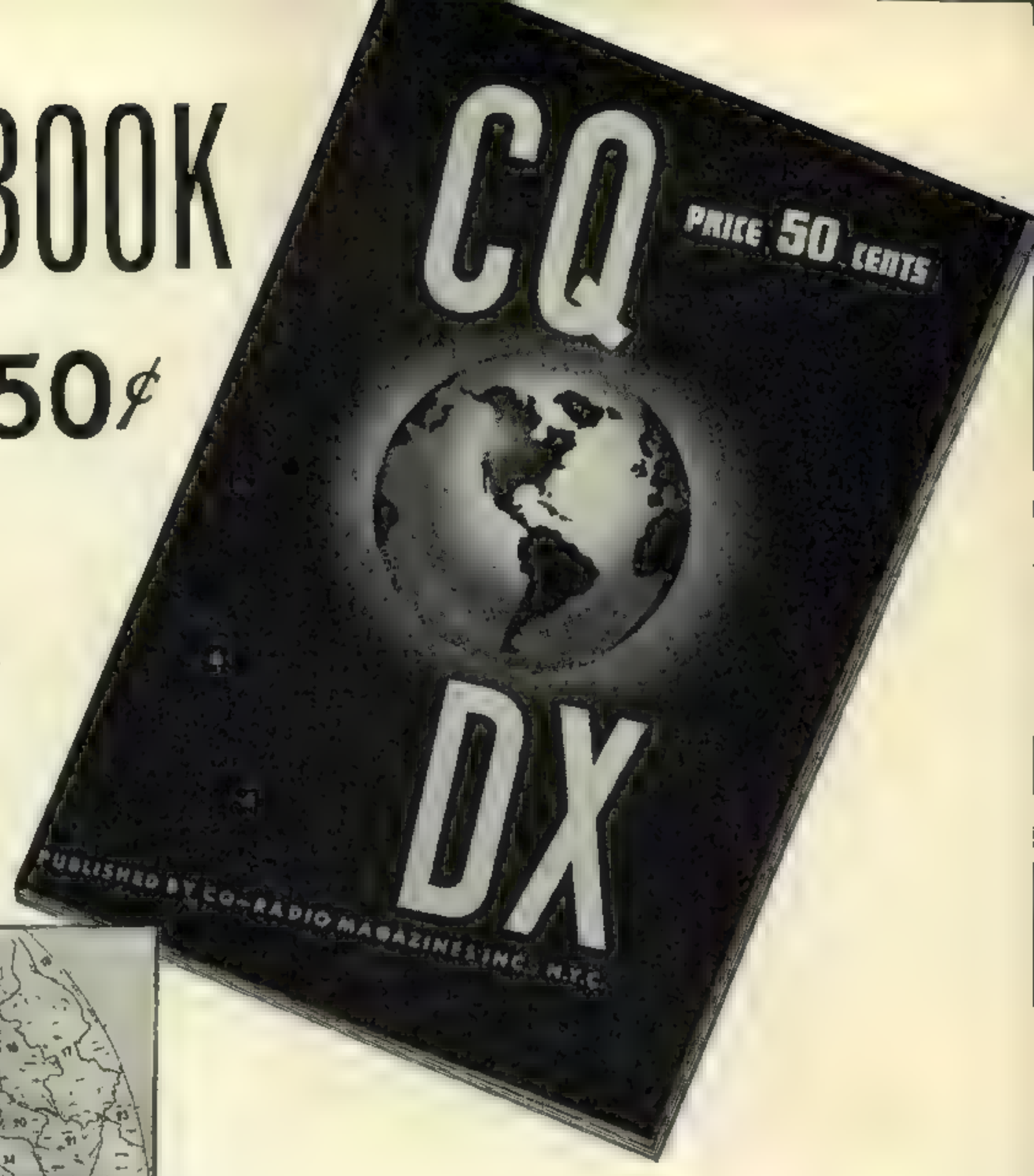

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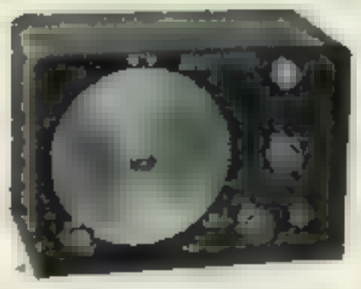

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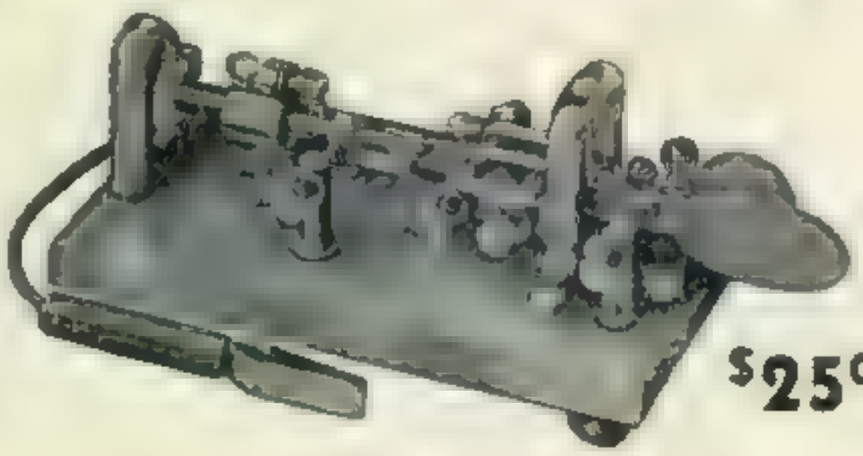

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tect with the b.f.o. on and many more contacts would have been possible if c.w. were used. As it was, we could identify about 50% of them on fone or i.c.w. The rest were too far down in the noise level.

We should mention that the rhombic is not the panacea for all antenna problems. It has the same limitations as any other antenna. It should be located in the clear or its capabilities may not be realized. In our particular case, although the lower corner of the antenna came within 6" of the ground, the main lobe went sailing off the side of the mountain with nothing in its path but free space. If you have a location where a rhombic can be erected properly and aimed in a desirable direction, it is a very simple antenna to construct and requires no effort to make it operate properly. It will work well terminated or unterminated. Ours was terminated because we wished to take advantage of its unidirectional properties. The terminating resistor was made up of 5-watt carbon units in series-parallel with a small tuned circuit incorporated to cancel the reactance at the operating frequency. This was set up on a "Q" meter and caused us no further worry. The quarter-wave matching section was included so as to enable us to use 300-ohm line instead of an 800-ohm open wire line. It could be used to match to any impedance line by constructing it to give the desired transformation, and if a "Bazooka" were included, it would also enable the rhombic to be fed with coax. The dimensions were the same as those given earlier in the text.

There were no cases noticed where stepping up the power from 100 watts to 300 or 400 watts made any appreciable difference in signal strength. It seems that if any expenditures are made for the improvement of 2-meter gear, instead of concentrating on power, the investment should be used to improve the antenna system and the receiver.

This is the story of a planned attempt to break the 2-meter record. That our efforts were crowned by success was probably due in some measure to good luck but the antenna, the rig, the receiver, all were as good as we could make them. They helped a lot.

DX PREDICTIONS

(from page 42)

This was noted earlier this season during August and September and will probably continue throughout a major part of October. The 20-meter band is predicted to open around 0445 hours EST with fair signals until 0900 hours EST. The 10-meter band to Europe from the eastern section of the United States should open around 0700 hours EST. Peak conditions on 10 meters may be expected between 1030 and 1230 hours EST. This band should close after 1430 hours. 20 meters will probably reopen with fair signals between 1600 and 1930 hours EST.

Eastern and Central U.S.A. to Australasia: The high MUF during October will also have noticeable effects on the paths to Australia and New Zealand. Scattered and weak 20-meter signals from "down under" may be heard throughout the early morning

(Continued on page 74)

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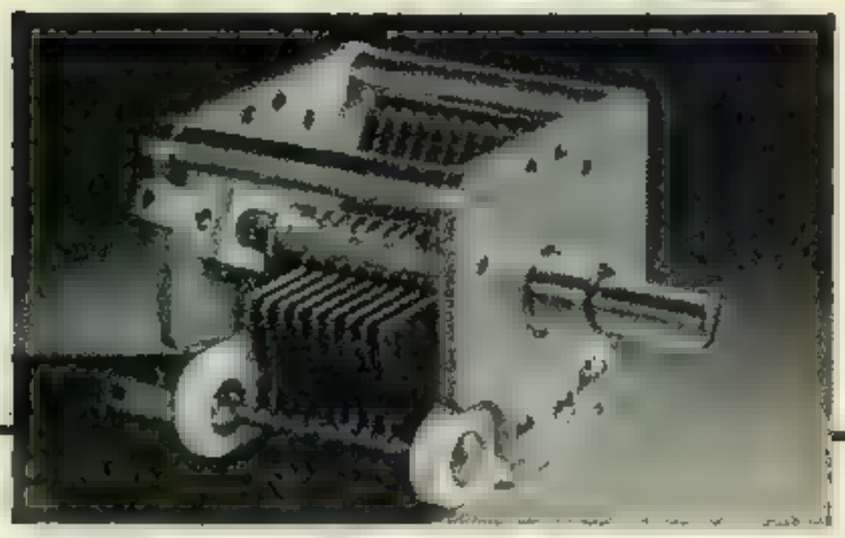

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in the eastern section of the country. A very sharp improvement in signal strengths will be observed around 0630 hours EST. Good signals will then be heard until about 0845 hours. 10-meter conditions to Australasia are very promising with the band opening around 1330 hours EST. Peak 10-meter conditions between 1730 and 1900 hours EST.

Entire U.S.A. to South America: A very high MUF is predicted for the paths from the entire U.S.A. to South America. A possible 6-meter DX opening is being covered in the v.h.f.-u.h.f. columns. As this applies mostly to the southern section it is interesting to note that the MUF from W1, W2, W3, W8, W9 and WØ is expected to be about 42.0 mc at 1300 hours CST. The 10-meter band will open around 0630 hours CST (or EST) and will close after 1830 hours CST. Good 20-meter conditions may be expected from 2100 hours until 0200 hours CST the following day.

The data for the predictions graphs are drawn from the "Basic Radio Propagation Predictions . . . Three Months in Advance" as issued by the CRPL of the National Bureau of Standards. These booklets are available on a subscription basis from the Superintendent of Documents, Washington 25, D. C. A detailed description of the method of operating the *Predictions* is contained in the handbook *CQ-DX*.

ZERO BIAS

(*from page 13*)

mail service, are but a few of the things that harass the staff . . . not to discount our own lassitude. But nevertheless, during the summer months we have been working on a new format for *CQ*, including many innovations to make the magazine more attractive and easier to read. We have gathered together during these months some of the finest articles that it has been our pleasure to review, so between the new readability, both editorially and mechanically, we think you will find *CQ* a still better magazine.

Some of the styling will be self evident, such as the new column and department heads. However, there is still one very important point that has not been definitely settled. We would like our readers' assistance in coming to a final decision.

Many of you will notice a new type face in the body of the articles. This type is available in different sizes, and with different spacing between lines. The face itself is highly readable, but the size and spacing determine to a great degree the overall readability of a made-up page. Previously we were using what is known as a 9 point type on a 10 point slug. The slug determines the spacing between each line. On a small page, such as CQ uses, this type, at least to us, seemed too large. Because of the space it required we were frequently unable to use as large size illustrations as we wanted, and in general the pages had a very "open" appearance. In going to this new format we have set some of the articles in 9 point on 10 point, and other's in 8 point on 9 point. The difference will be readily observed in comparing say the lead article, "A Phone Man's

(*Continued on page 76*)

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Modulator," with "Zero Bias All the Way." This editorial is set in 8 on 9, the size we would like to use for feature articles. But we are very anxious to know which of these sizes the readers prefer, keeping in mind that 8 on 9 permits us to do a better makeup job each month.

Columns are another thing. We have always set them in 8 point solid, that is 8 point on an 8 point slug. Our reasoning here has been that the most timely material appearing each month, and perhaps most eagerly read by the operating hams, is the columns. Maximum space is obtained by reducing the type size, and line spacing, although it is at the sacrifice of readability. However, if not too much of the book is set in the small type the average reader can adjust his eyes to it with no difficulty. In some instances we have even used 6 point type, although this is strictly as a last resort. At any rate we have used layouts, type faces, and sizes that we believe will bring to our readers a still finer looking magazine. Incidentally, we have, of course, considered something like 9 on 9, but experts in the field of typography have proved conclusively that it is easier to read a smaller type size with more open space between lines than a larger face with lines tightly set.

Drop us a postcard with your opinion, it will be sincerely appreciated.

THE YL'S FREQUENCY

(*from page 54*)

and relieved—to find maximum signal strength coming from the direction of lower Manhattan instead of Cuba!

John told us, incidentally, that there are only two active YLs in Cuba—Maria E. Diaz Armenteros, CO2QK, the XYL of CO2PZ, and Rosa Lopez Alba, CO2RA (ex-CO7AQ), the XYL of CO2AY. We hope to bring you pictures and write-ups on both of them soon.

Apologies

Our apologies to W8UDA. In our August column we mentioned Lucille Sweet, W2SCI, as being the first sightless YL in W-land. Actually, W8UDA, Dorothy Willett, should have that credit—or so we were very promptly informed by W2JA, David Carruthers, who writes:

"Have you ever heard of W8UDA? I have frequent skeds with her and she is, and always has been, completely sightless. As a matter of fact, she is the girl who first got my XYL interest in ham radio (Something I could not do myself!) She types perfectly, has written articles for the YLRL paper, is a teacher of Braille in Flint, Mich., and, I believe, was the first blind YL this country ever had.

"Just thought I would put you straight on the subject. By the way, Dot, W8UDA is an excellent op. She can loaf along at 35 w.p.m. with the best of us men, and copies through any kind of 40-meter QRM. You can find her any night on 7286 or 7220 kc, if you can go fast enough. Her QSL card has a very beautiful picture of Dot and her 'seeing eye dawg.'"

YL of the Month

A letter received recently from an OM in W3 asked how he could have a YL friend of his nomin-

(*Continued on page 78*)

IDEAL MIDGET COILS FOR HIGH-FREQUENCY USES

These little B & W Miniductors are just what the doctor ordered for all sorts of high-frequency inductance uses in modern rigs. "Air-Wound" construction assures real efficiency because there's an absolute minimum of insulating material in the electrical field. Miniductors come in standard diameters of ½", ⅝", ¾" and 1" and can easily be cut down to any desired number of turns. Each diameter comes in 4 different winding pitches. Write for the complete B & W Air Inductor Catalog.

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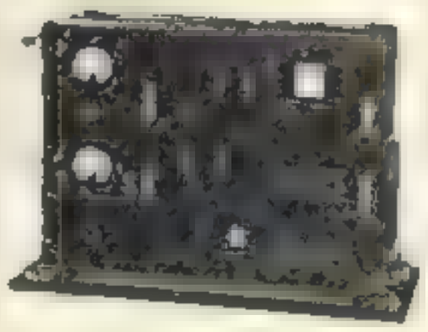

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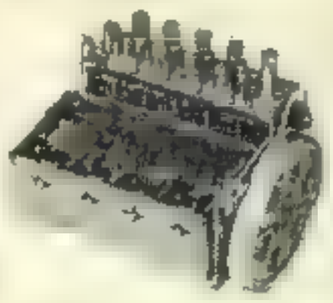

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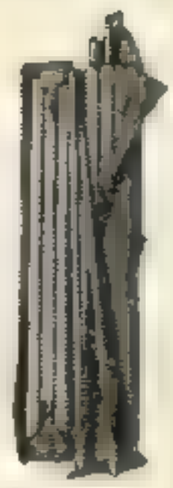

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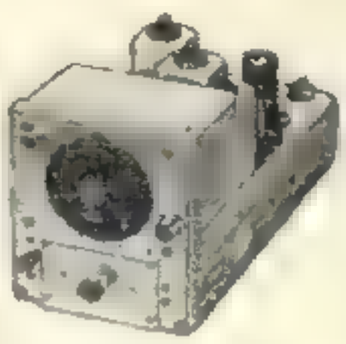

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Matches 500 watt BC610 transmitter to antenna. Contains variable antenna coil with counter, vacuum cond., 15 amps R.F. meter.

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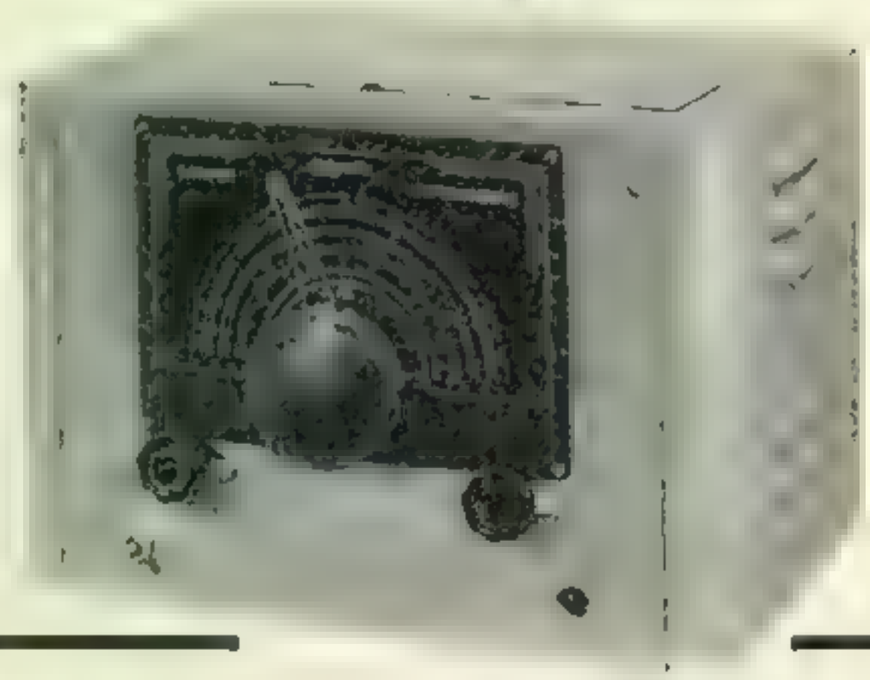

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Designed to operate directly from 105-125 volt 60-cycle A-C source, this converter uses the new selenium rectifier and three new-type miniature tubes. One 6BA6 as tuned R-F stage—one 6BE6 as mixer—one 6C4 as H-F oscillator. Single-dial tuning for controlling H-F oscillator—separate control for R-F stage. This feature eliminates tracking error. Mixer gain may be varied by separate bias control, thus permitting optimum signal-to-noise ratio regardless of receiver used. Stand-by switch controls both converter and receiver. Plug-in coils employed for all bands, one set to cover 50 to 54 mc range and another to cover from 27.180 o 29.7 mc. Output transformer adjustable from 4.7 to 6.5 mc. Kit comes complete with punched chassis, panel and cabinet as well as all parts for one band and complete instructions, less tubes. Gray crinkle cabinet 8" x 12" x 8". Shpg. wt.: 15 lbs.

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ated as YL of the Month in *CQ*. For any others of you who may have wondered the same thing and who have a candidate for a write-up, it is very simple —just send it in! If any of you know YLs who have especially interesting backgrounds, we'd be very happy to have your "nominations."

This time, as your YL of the Month, we'd like to present W2SCI, Lucille Sweet, of Rochester, N. Y. Although not the "first" sightless YL, Lucille is an active and enthusiastic one. In fact, so much so that she is singing the praises of ham radio as an exciting hobby for blinded war veterans.

Lucille studied for about a year prior to taking her examination. She found code quite easy as she knew typing and had very little trouble getting accustomed to copying it on the mill. Theory was quite complicated at first, but her friend and instructor, Leo Enright (call) came to her rescue by ingeniously stringing wire over pins stuck in cardboard, enabling her to follow his description of the circuit diagrams.

"I received my station license on August 21, 1946, and the call W2SCI (Sweet, Charming, Irresistible). It wasn't until March 1, 1947, that I got my transmitter set up and on the air. Went on 10-meter phone on 29,144 and 28,875 kc. and, after contacting a local for a test check, I QSOd a station in Houston Texas. Since then I have worked all over the states and a good bit of DX. The rig here is an HT-9 running about 100 watts to a folded diple and the receiver is a Sky Champion. Am studying for my Class A ticket at the present time."

There is no such word as "handicap" in Lucille's personal lexicon. Only 23, Lucille has been a machine operator at Kodak Park for over three years and thoroughly enjoys her work. In addition she takes lessons in tap dancing and says that it's just the thing to offset those long evening hours at the mike.

"A blind person should tackle anything he has any desire to do," says Lucille, "whether or not it sounds possible. Once you really try, it is surprising what you can accomplish. And hamming *is* great fun, making friends all over the world, and of course getting QSLs from all those stations."

AMATEUR NEWCOMER

(*from page 28*)

strips and tube sockets are mounted on the board by means of wood screws and spacers cut from 3/8" birch dowel rod, drilled through; this makes a sturdy mounting for these parts and still separates them from the base for ease of wiring. A piece of No. 12 tinned bus bar runs between two of the screws fastening the transformers to the board. This bus provides a common grounding point for the entire amplifier. The volume control is mounted on a 1-inch strip of aluminum about 2 3/4" long with a right-angle bend to take the two wood screws holding it to the base. It is wise to mount the two transformers with their cores at right angles so that the magnetic coupling between the two will be a minimum. It will be noted from the wiring diagram of the amplifier that all of the wiring for the input is shielded; this procedure should be followed to avoid chance of stray pick-up.

The input and output terminal strips both have four terminals, and some explanation on the reason for this should be given here. Terminal *3* is connected directly into the volume control; when it is

(*Continued on page 80*)

AMATEURS . . .
A NEW BAND
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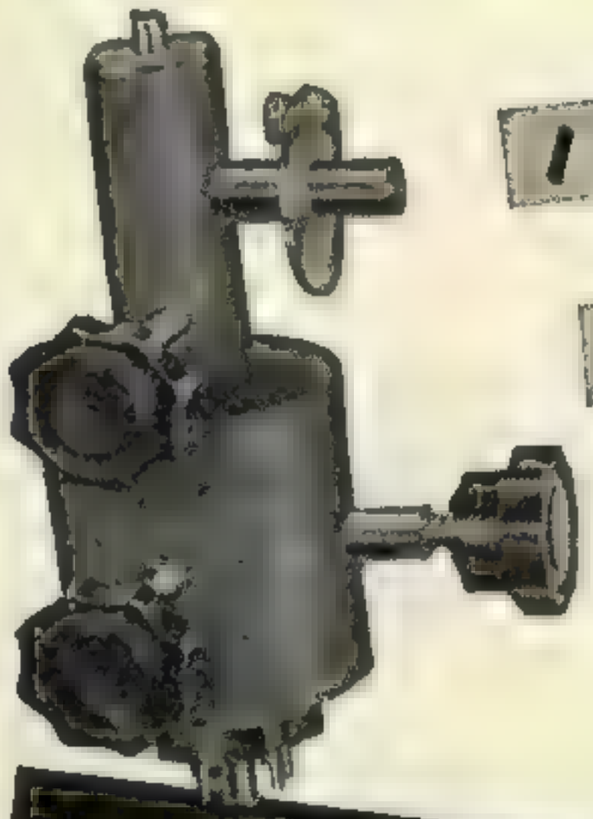

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necessary to use the amplifier without using the input transformer, the signal (input voltage) is applied between terminals *3* and *G*. There will be instances when it will be desirable to use transformer coupling into the amplifier; to do this, terminals *2* and *3* should be connected together and the input may then be applied to the transformer primary by using terminals *1* and *G*.

The output of the amplifier generally will be taken from the voice-coil winding of the output transformer, with terminals *6* and *7* connected. One word of caution: Operation of the amplifier without the jumper connection between *6* and *7* and without other provision for connection of plate voltage to the tube will cause the screen to draw excessive current, damaging the tube permanently.

If a "universal" type output transformer is used, the builder will have to determine from the manufacturer's data for that transformer which connections are to be used to give the proper impedance. The reader is reminded that the transformer is required to match the 2500-ohm plate load of the 6L6 to the voice coil of the speaker, which will be about 6 ohms.

Testing the Amplifier

To test the amplifier we may use the crystal set described in a previous article. Connect the headphone terminals of the crystal set to the input of the amplifier, joining the ground terminal of the detector to terminal *G* of the amplifier, and the other terminal of the detector to terminal *3* of the amplifier input. When this has been done, connect the amplifier to the power supply, observing the polarity of the high voltage.

After the supply has been properly connected to the amplifier, turn on the primary switch, being sure that the high-voltage switch is in the "off" position. Observe the heaters of the tubes to determine whether they are operating or not. The tubes

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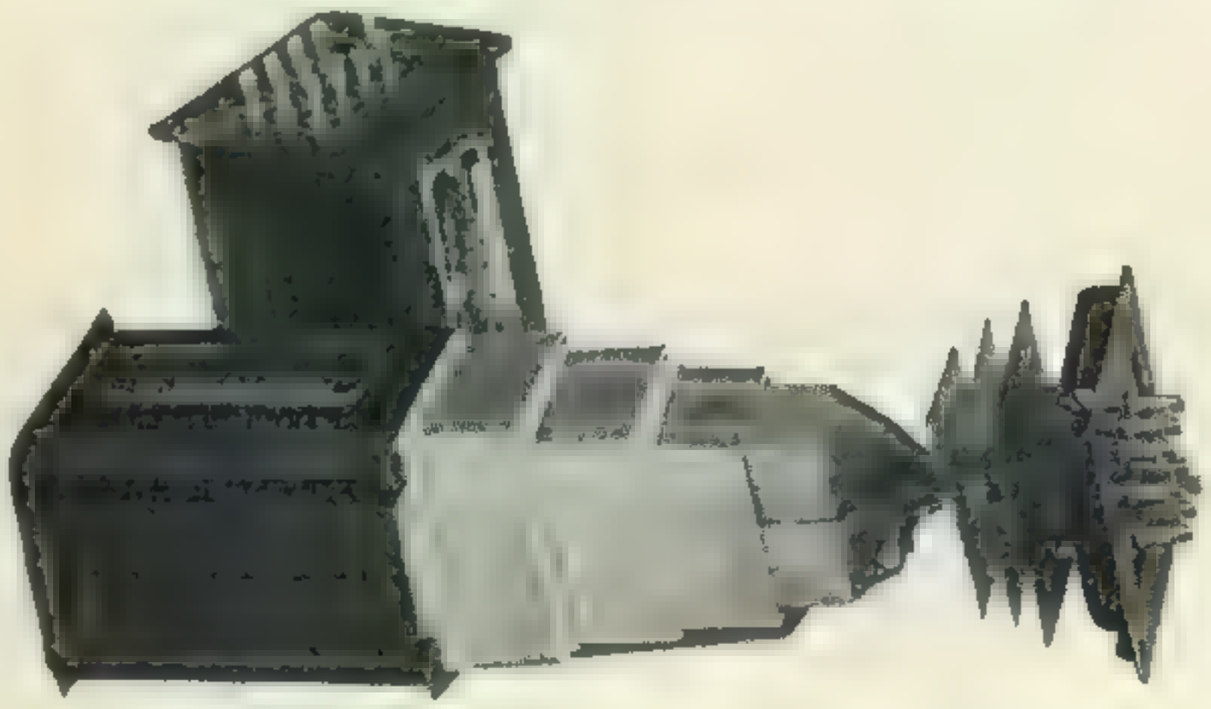

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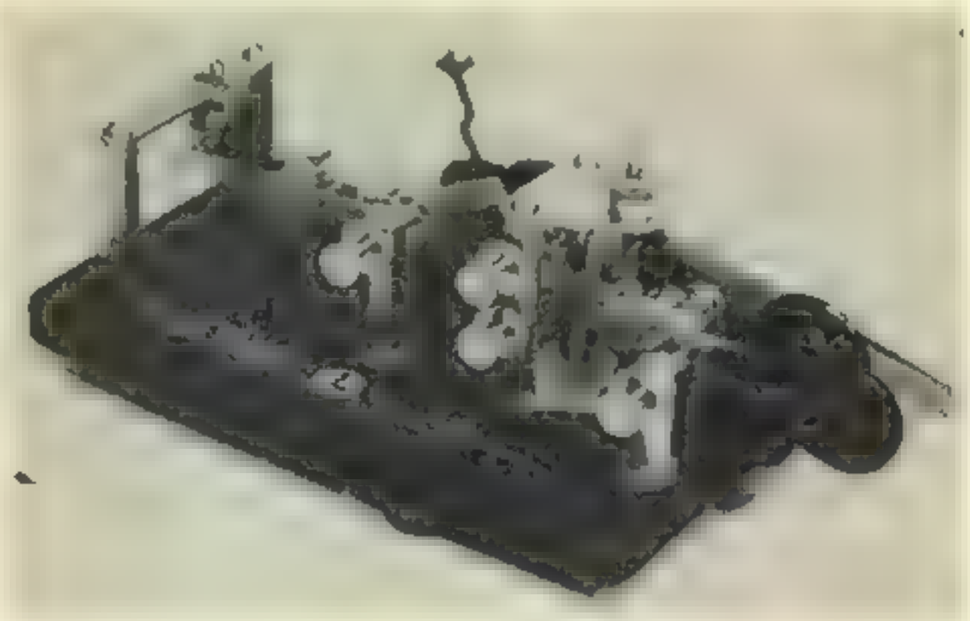

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will require 10 to 15 seconds to heat. With the volume control partly advanced the signals previously heard on the headphones should now be reproduced by means of the loudspeaker when the high-voltage switch is turned on.

When the operation of the amplifier appears to be satisfactory, it is ready for use with the vacuum-tube detector to be described in the next installment in this series.

PARTS AND PRODUCTS

(*from page 56*)

chart for definite frequency reference. Absolute frequency retrace may be obtained by beating the 5th harmonic of the 2-mc fundamental against WWV on 10 mc.

Output coupling reactance on the v.f.o. is entirely eliminated. Grounding the output or coupling a tuned circuit to the Exciter will cause a frequency shift of less than one part in 8,000,000. Oscillator stability is virtually unaffected by changes in line voltage of as much as .. 25%.

Occupying a space of little more than 6" cubed, the four multplier tubes provide fundamental driving power on all bands into the 807 grid circuit. Multiplier plate circuits are of the band pass type and do not require tuning. The 807 power amplifier output provides sufficient power to excite the newer power tetrodes to one kw input, or may be used to drive triodes to as high as 300 watts input.

For those who do not require the complete unit, the Model 502 v.f.o. complete with dial assembly and full instructions may be obtained separately. The v.f.o. is capable of driving a 6L6 or similar tube to normal output as a straight amplifier or doubler. Full details will be sent on request to B&W.

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CO151	8-8-8-8	600 V	4⅝ x 3¾ x 3¼	2.95
CO154	2 mf	1000 V	4¾ x 1¾ x 1	.95
CO155	4 mf	1000 V	4¾ x 1¾ x 1	1.45
CO156	10 mf	1000 V	4¾ x 3¾ x 1⅝	2.69
CO157	10 mf	1000 V	4¾ x 3¾ x 1¼	2.69
CO158	4 mf	1500 V	4⅞ x 3⅝ x 1¾	2.25
CO161	1-1 mf	3000 V	5 x 4 x 2½	3.25
CO162	1 mf	3600 V	6 x 3 x 1	2.89
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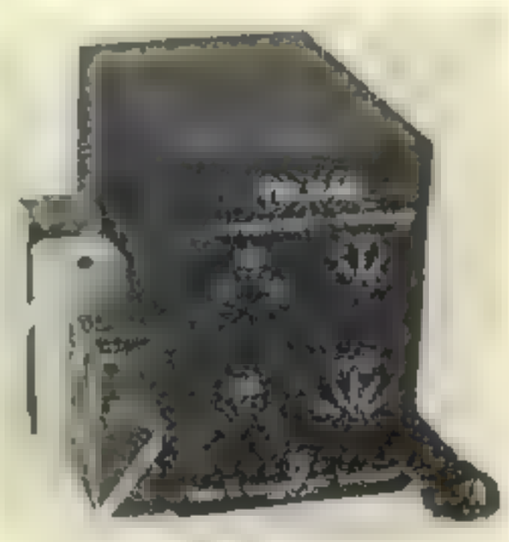

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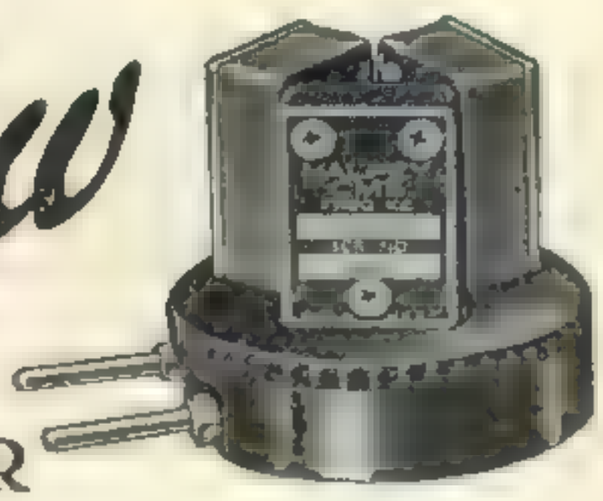

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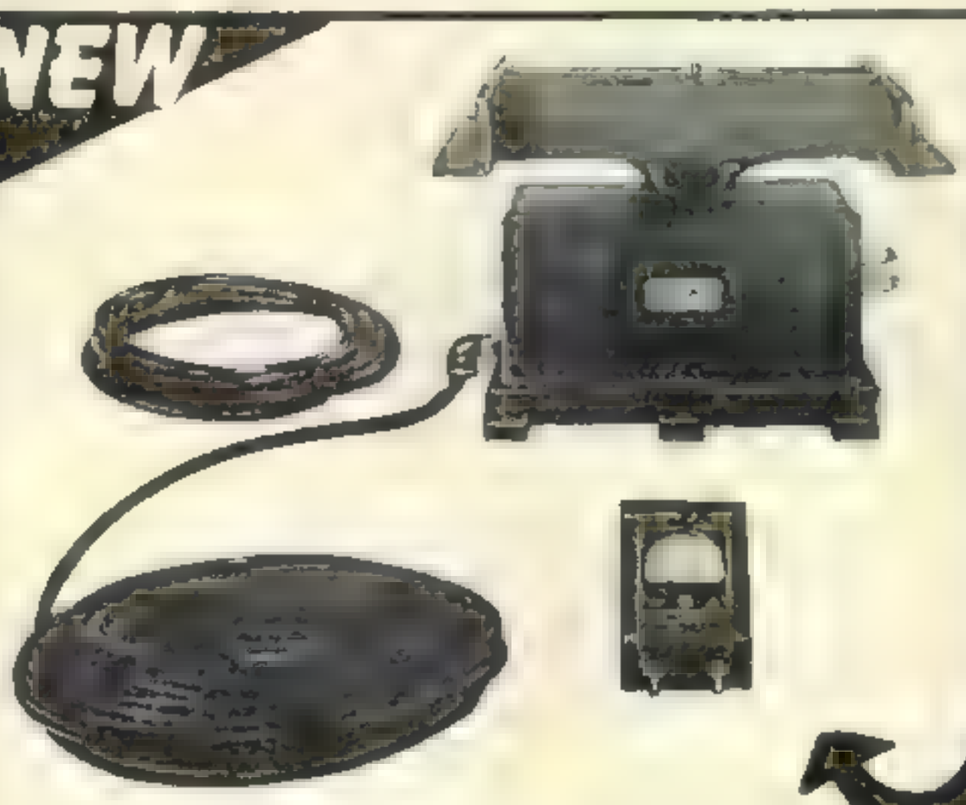

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R AND C TESTER

(from page 38)

follower gain is 0.9. In other words, the null indicator loads the circuit of the bridge at about 100 megohms. This feature permits an accurate measurement of very high resistances or very small values of capacitance. The cathode follower feeds a 6SF5 amplifier where the 200,000-ohm potentiometer (*R16*) acts as a sensitivity control. The output of the 6SF5 drives the 6E5 magic eye. With this very high gain the audio voltage requirement from the 1000-cycle source is about one volt.

The total plate current drain is low enough to permit the use of a simple RC hum filter in the plate supply. Although a 5Y3 rectifier is indicated a low drain rectifier such as the 6X5 could be substituted with the appropriate connections. The whole unit is housed in a 10″x 8″x 7″ metal cabinet. The large ratio dial plate was made of a piece of aluminum about 6 inches in diameter, with a large knob and indicating pointer attached to the 2000-ohm wire-wound potentiometer. The lettering was done with a small hand lettering punch set over lead pencil calibration points.

FRIENDS WITH A BUG

(from page 21)

so that the weight can be made to bind on the shaft at any point or released by simply turning it on the shaft.

Maintenance

Maintenance is no problem—with reasonable care, the semi-automatic key will last a lifetime, as one manufacturer bitterly said while showing us one bug over twenty five years old. Don't oil 'em, any more than you would a straight key. The pivots are part of the electrical circuit in this thing, too. Don't burn the contacts by keying too big a load directly—this applies especially to primary keying, which has a tendency to weld contacts together on current rushes—and don't slap a big condenser across the bug for a click filter unless you add a resistor in series with the condenser to cut down the spark on closing the contacts. If you do slip a bit and discolor the contacts, a pencil eraser or typewriter eraser should be tried on them before you get down to the brutal work of using a file.

If you run into trouble with clicks when using the bug, but have no trouble when using the straight key, check and see if the bug is quiet on the dash side; if it is, but kicks up clicks on dots, a bypass from the dot-contact screw to the frame, or to the dot-lever stop, should clear up the trouble. If you have clicks on both dots and dashes, remember that

the bug and its cord may radiate, and you may have to do some filtering at the bug itself, even though you have a filter at the straight key.

Left Handed Bugs

What about left-handers? Most southpaws learn to use a right-handed bug, although at least one manufacturer makes a reversed model. Of course, you can make a left-handed job out of a right-handed one, though it may not look like a thing of joy, by simply disassembling it, drilling a few holes here and there, and reassembling it on the under side of the base.

Now that you realize the work involved to get a bug adjusted, you'll know why it is one of the cardinal sins of radio to monkey with another fellow's bug. There are radio men sailing the seven seas who wouldn't mind if you used their toothbrushes, but who would shove you right across the high voltage if you made a wrong move around their pet bug. Don't say we didn't warn you.

PHONE MAN'S MODULATOR

(*from page 19*)

The microphone jack which is in the exact center of the speech amplifier is mounted so that it extends through the front panel. A large clearance hole is made in the front panel to provide for this. The shafts of potentiometers *R5* and *R7* are cut relatively short so that there is no difficulty in removing the small chassis from the modulator unit.

Photograph B also shows the space behind the speech amplifier chassis. This is necessary so that the small chassis may be moved back to remove the control shafts from the front panel. An inch and a half will allow plenty of room for this.

Under chassis details of the modulator proper are clearly shown in *Photograph D*. The two 805 sockets are mounted under the 3" x 13" x 17" chassis. This was done in order to keep the overall height of the unit small, and as a result, a 12¼" relay rack panel is used. The filament transformer, *T2*, mounts next to the rear 805 tube, and next to it is *T3*. The large transformer with the extra taps is the plate transformer for the speech amplifier tubes. The extra filament taps can be used in series with the primary, either bucking or aiding, in order to adjust output voltage, especially if a different tube lineup were to be used in the speech amplifier. With the circuit shown this was not necessary, as the right voltage was obtained directly from the secondary high-voltage winding.

The unit mounted on its side is the choke, *L1*. Resistor *R21* and the parallel condenser combination making up *C12* lie between *L1* and the center 805. The high voltage relay is mounted

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on the chassis with the stand-offs furnished with the relay. The layout as shown allows clean wiring, and in addition, even leaves enough room under the chassis for any other small parts that you might want to add at some time.

Operating Adjustments

When the unit is all set to go, the speech amplifier may be turned on alone with switches *SW1*, *SW2*, and *SW3* if the high voltage is not connected to the rear terminals. The first step would be to adjust *R7* so that the center arm is grounded. This removes the a.m.c. With a signal generator, or just a microphone, apply an input to the input jack. This point takes either a dynamic or a crystal microphone. The gain control (*R5*) should then be turned up and the output checked into whatever load you are using. A 3000-ohm, 10 or 20-watt resistor may be connected across pins 4 and 6 of the octal socket, and will serve nicely as a load. (Remove the 805 tubes from their sockets if you do this.)

If a signal generator is available, a frequency response curve can easily be made, by holding the input voltage constant and measuring the output with an output meter across the 3000-ohm resistor. After this check has been made, the a.m.c. may be turned on by control *R7* and the curve of *Fig. 2* verified. If the a.m.c. does not seem to be working correctly, check to make sure that your connections are all made properly, as this type of compression is not at all tricky, and no trouble should be experienced.

If a scope is available, the output may also be checked by this means. It is always advisable to be able to look at the output wave. In some cases this wave may not be symmetrical. If this happens to be the case, the first point to look at is the phase inverter circuit. Resistors *R9*, *R10*, *R11* and *R12* should be changed in value, one at a time, until this condition corrects itself.

Voltages on the speech amplifier tubes are not too critical, but should be approximately the following values:

Tube	Plate voltage (Measured at plate pin)
6BA6	70-75
6AT6	135-150
6C4	125-130
6AQ5s	250 (maximum)

With the 250 volts on the plate and screen of the two 6AQ5 tubes, the current should be approximately 90 milliamperes in the plate circuit and 9 milliamperes in the screen circuit (both tubes).

The modulator circuit should need no adjustments, but it might be wise to measure the bias voltage across the 866A tube. Any value from 9 to 15 volts is acceptable. Feed the high voltage into terminals A, B and C, and you are on the air.

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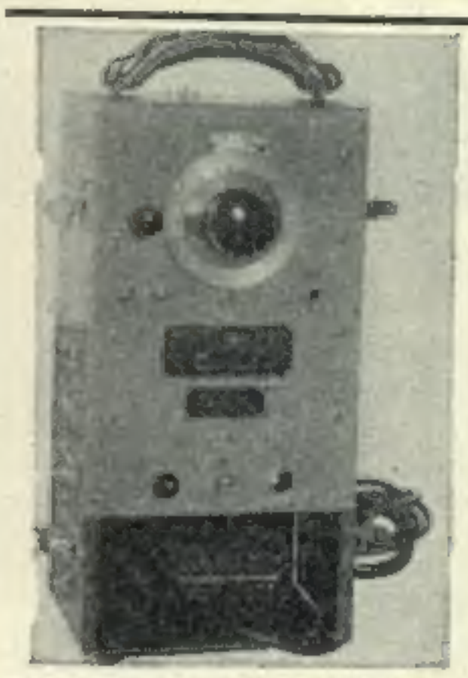

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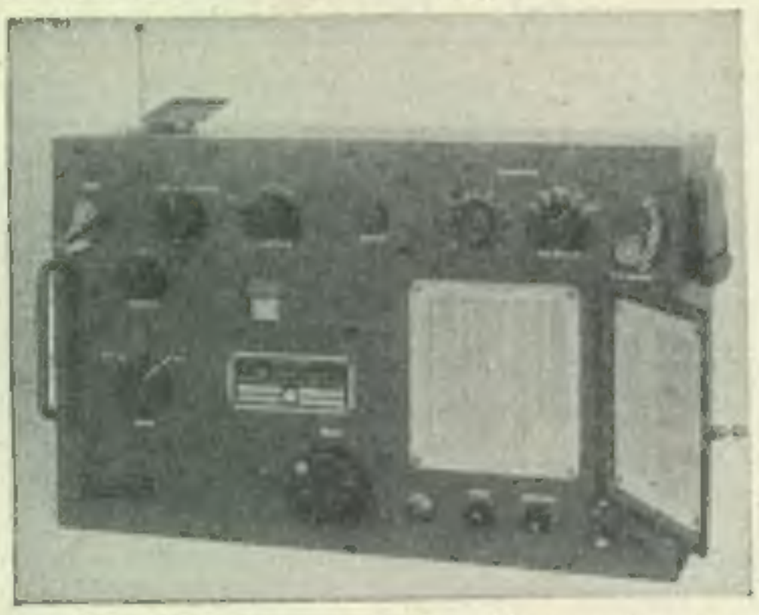

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